

Nutrition Discussion Forum

The use of glycaemic index tables to predict glycaemic index of breakfast meals

Brand-Miller and Wolever seem to have forgotten what they promised millions of readers in their popular books, *The G.I. Factor* and *The Glucose Revolution* (1st and 2nd editions), namely that: ‘Normally real meals consist of a variety of foods. We can still apply the G.I. factor to these real meals even though the G.I. values are originally derived from testing single foods in isolation.’ They have never told their readers that the glycaemic index (GI) cannot be calculated in composite meals if the fat content is higher than 40% (Brand-Miller & Wolever, 2005).

Essentially, what we did in our study (Flint *et al.* 2004) was to take 13 of the most commonly consumed European breakfast meals, predicted their GI based on the methodology described by Brand-Miller and Wolever and recommended by WHO (FAO/WHO Joint Expert Consultation, 1998) and subsequently tested the true glycaemic response in 18–21 healthy volunteers. What we found was that there was not even a weak correlation between the predicted and the actual measured glycaemic response. This also applied for the situation in which we limited the analysis to meals with more than 55% of the energy derived from carbohydrates. Actually, even in multiple regression analyses the relative carbohydrate content of the test meal did not make any significant contribution to the measured postprandial glycaemic response. In contrast, we found that the fat content and the combination of fat and protein content could explain almost all of the variation. Moreover, we failed to find any correlation between the measured glycaemic response and the measured insulin response, the relationship on which the entire concept of the popular GI books is based. This finding, taken together with results from numerous other studies, demonstrates that many factors other than the type of carbohydrate are relevant for GI; for example, the ripeness of a banana changes its GI substantially, physical form is important, and milk and dairy products increase insulin without increasing glucose.

It is unfortunate that Brand-Miller and Wolever are unwilling to accept studies that challenge the idea that the GI concept is a universal solution in achieving a healthy diet and controlling body weight. Because of their strong personal economic interests in the GI concept, including books, laboratory facilities and patents, we suggest they may be biased and find it difficult to look objectively at data that may contradict their viewpoints. Their first comment (Brand-Miller & Wolever, 2005), that it is necessary for the glycaemic response to a reference food be tested three times in each individual, is interesting. This requirement actually confirms our view stated in our paper (Flint *et al.* 2004) that there is a large variability in GI due to unrelated factors, including the day-to-day variation in the same subject.

To answer the specific methodological concerns raised by Brand-Miller & Wolever (2005), we have the following comments.

- (1) Besides the comments on this point mentioned above can be added that several studies referred to in the international tables also performed only one analysis of the reference food. Does this invalidate these values? In contrast to a lot of other GI studies we have tried to overcome the large variability by including a large number of subjects, i.e. each of every single meal was tested in a minimum of eighteen subjects.
- (2) We admit that the sentence on measurement of available carbohydrates in the paper is short and may be misunderstood. In fact, we measured free glucose after 30 min and, with the assumption of this being derived from sucrose, we estimated the total content of sucrose and added that to the amount of starch, which was measured after 120 min as described in detail in the Englyst starch kit (Product no. 61-000, procedure 3.2). In the case of milk products the amount of available carbohydrates from food tables was used. Thus, the available carbohydrate content has not been underestimated and cannot explain the ‘very high observed GI of many of the meals’. The porridge meal is, in fact, the only meal with a measured GI above the predicted GI and above 100, whereas the observed GI of the rest of the meals is lower than predicted.
- (3) When we performed the study, GI values on All-Bran Regular and Frosties were not available in the international GI tables (Foster-Powell & Brand-Miller, 1995). However, Kellogg’s were able to provide us with this information even though their results had not yet been published. The All-Bran Regular product in Denmark is equivalent to Bran Flakes in Australia and All-Bran Flakes in South Africa. The mean value of these two products (a GI of 102) was used. Similarly, unpublished values from Australia and South Africa for Frosties were used. Moreover, the GI values for the Australian products have now been published (entry 162: Bran Flakes, GI = 106 and entry 177: Frosties, GI = 79; Foster-Powell *et al.* 2002). Finally, if we had used the value of a GI of 52 for pureed apples, as suggested by Brand-Miller & Wolever (2005), instead of the assigned GI value of 89 for apple sauce, the discrepancy between predicted and measured values would have been even greater.
- (4) We agree completely that there is high variability for different varieties of bread in the GI tables, but we do not believe that this would explain the large discrepancies in our study in the bread meals between predicted and measured GI, e.g. 26 v. 91, 27 v. 91, 30 v. 99, 49 v. 100, 56 v. 96, 71 v. 94. This variability nevertheless emphasises the limited value of such tables, particularly when considering the enormous amount of work involved in compiling them and

the never-ending need for continuously updating them with new and locally produced products (preferentially with measurements also made in different population groups, such as children, athletes, diabetics, and overweight and obese subjects).

- (5) Brand-Miller & Wolever (2005) claim that we use a small range, between 74 and 100 for most meals. The range in all meals tested was in fact between 55 and 100, and this range is comparable to ranges used in other studies (e.g. Wolever & Jenkins, 1986; Chew *et al.* 1988).
- (6) As stated above regarding the triple testing of the reference food, papers with venous blood sampling are included in the international GI tables on equal terms with studies using capillary blood sampling. We used venous blood owing to the fact that we also sampled blood for analysis of insulin and other hormones. Also, we performed this study before the interlaboratory study by Wolever *et al.* (2003) was published. In their study five different experienced GI laboratories measured identical, centrally distributed food products using the capillary blood sampling method. They obtained quite substantial differences in GI values when measuring rice and spaghetti of more than 30 GI units.

Finally, Brand-Miller & Wolever (2005) misquote another study from our laboratory (Sloth *et al.* 2004), which Brand-Miller (2005) has criticised in a letter to the Editor of the *American Journal of Clinical Nutrition*. Among other things the study was criticised for using *in vitro* as opposed to *in vivo* methods to pre-test the GI of food products used in the 10-week intervention. We therefore wonder why they state here (Brand-Miller & Wolever, 2005) that the study relied on table values.

To sum up, what we have tried to do in our predictability study is to analyse the usefulness of the tools that are available to consumers, i.e. the international GI tables and popular books, in the context of predicting the GI of a mixed meal. Despite a few points, which we agree we could have done differently, we and others (Laville, 2004) believe that we have performed a well-designed and well-powered study with valid results. The findings of, first, no significant correlation between predicted and measured GI and, second, no significant correlation between measured glycaemic and insulinaemic responses make us question the practical usefulness of GI in an everyday context and call for caution in relation to dietary recommendations.

So, returning to the start where GI was proposed as an adjunct to food composition tables (Jenkins *et al.* 1981), we fully recognise that different types of carbohydrates influence human physiology differently. However, we do believe that it is questionable to use GI as a single important factor of a healthy diet, due to the obvious methodological problems. The focus should rather be on foods – whole-grain products instead of refined, for example – when recommendations are made.

Conflict of interest

None stated.

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