A Glycemic Response Update

This column will focus on the latest on the glycemic response as reported in the 2008 supplement of the American Journal of Clinical Nutrition (AJCN) (1,3,4,5,6,7). The supplement emanated from an International Life Sciences Institute–Europe (ILSI–Europe) two-day workshop in Nice in December 2006 titled Glycemic Response and Health. The input for the workshop was a Cochrane-style review commissioned by the Dietary Carbohydrates Task Force of the European Branch of ILSI–Europe. The comprehensive review was conducted by Geoffrey Livesey, currently the principle of Independent Nutrition Logic, Ltd. The more than 60 attendees from around the world received the draft review and were expected to have prepared comments for discussion at the meeting. Several other documents including the summary of a scientific issues discussion conducted by ILSI–North America, facilitated by David Lineback (2), were also part of the preworkshop packet of materials. The workshop began with a short report where I described the deliberations of AACC International’s Task Force on Defining the Glycemic Response. This was followed by speakers from around the world providing data and commenting on the review document. In addition to hearing the speakers and discussing with the assembled group of scientists, attendees and speakers participated in one of four working groups: Health Aspects, The Relative Importance of the Glycemic Index (GI)/Glycemic Load (GL) and Other Parameters, Glycemic Index Methodology, and Applications and Implications. All groups were charged with answering a set of general questions and each group was assigned some specific questions.

At the end of the conference, based on the comprehensive review and data presented during talks and discussion, the following points of agreement were put forward and are discussed in the summary articles cited in the 2008 supplement of AJCN.

While the conference focused on GI and GL, the most resounding point of agreement at the conference and reflected in the papers was that unavailable carbohydrate (e.g., dietary fiber), independent of GI, seems to have at least as big an effect on health outcomes as GI itself. In fact, it is important to health for many reasons. Fiber helps to lower energy density and aid weight maintenance. Some types of fiber can increase viscosity of the contents of the gut and slow the absorption of food components and the rate of glucose uptake. All types of fiber can alter gut transit and promote gut fermentation, which can cause short chain fatty acid production. Short chain fatty acids can inhibit a rate-limiting enzyme involved in cholesterol synthesis, B-hydroxymethylglutaryl-CoA reductase. Thus, many of the health outcomes of low GI foods could also be attributed to a food’s or diet’s dietary fiber content rather than the low GI or GL per se. The group agreed that there should be widespread and continued effort to increase dietary fiber intake because of its extremely positive effects on health.

Another point of agreement is that diets that are lower in GI and GL are beneficial for persons with impaired glucose tolerance and that the larger the divergence of glucose metabolism from the norm, the larger the effect of lower GI and GL interventions. Fasting blood glucose (FBG) and glycosylated hemoglobin, better know as hemoglobin A1c (HbA1c) was lowered with reduced GI diets in those with impaired glucose tolerance eating diets. In this population, both HbA1c and fasting glucose are related to cardiovascular risk. Furthermore, insulin sensitivity is also increased with diets low in GI and high in unavailable carbohydrate (dietary fiber) for those with dysglycemia. The actual effect of the GI of a food on glucose tolerance could not be sorted out from those of the food’s dietary fiber, which has a documented effect on glucose tolerance. However, there was no agreement that such interventions benefit those considered part of the healthy population. However, it was noted during the discussion that there are one million undiagnosed diabetics and an even larger number with impaired glucose tolerance in Europe that comprise part of the “healthy” population. Another point of agreement is that low-GI diets for those with elevated glucose have a positive effect on cardiovascular risk factors in the short term. However, there is insufficient evidence for the long term.

Another point of agreement is that there is only weak evidence that the reduction of dietary GI/GL has any effect on general well being of healthy people. While the reviewers suggested that it is plausible that the changes in dietary GI/GL might affect cognitive performance, it was agreed that more research to assess these possibilities was needed.

Along with the discussion on GL, there was much discussion on the way a lowered GI/GL diet was achieved. It was noted that a lowered GI/GL might be achieved by increased protein, polyols, fructose, lactose, or other ways to slow glucose release into the bloodstream. Or a lowered GI/GL diet could be achieved through ingestion of a diet rich in fruits and vegetables. Thus, it may be difficult to make generalizations about the effects of a low GI/GL diet because the foods and diet quality used to achieve the lowered glycemic response can vary dramatically.

In terms of weight loss, the effects of low GI/GL diets on body weight maintenance and weight loss is confounded by both the amount of fiber in the diet and the reduction of energy that oc-

1 Livesey chose to use unavailable carbohydrate as some definitions of dietary fiber did not include substances such as inulin or resistant starch. The AACC Intl. definition of dietary fiber would include these substances, so in the other parts of this document I will use the term dietary fiber.
curs with these diets. More data are needed on the precise composition of diets in the scientific literature with a low GI/GL because changes in both macro- and micronutrient composition as well as total energy can have different effects.

It was agreed that the effects of GI/GL on satiety and on athletic performance need further study. There is concern by some at the workshop that research that supports label statements, such as “feel full longer,” which appears on products in the UK, needs to continue in order to characterize the precise response claimed by the statement.

There was no support to lower the dietary recommendations for carbohydrate, which suggest that at least 40% of energy be derived from carbohydrate. Those present at the workshop wanted any advocacy for a low GI/GL diet to be done in this context so that the GI/GL of the diet is not achieved by severely limiting carbohydrate intake. There was also agreement that low GI/GL diets should not be achieved by increasing either total energy or the fat or protein content or through excessive substitution of sugar alcohols or sugars with low GI values, e.g., fructose.

Consumer understanding of the GI/GL concept was also discussed. It was agreed that consumers fail to understand the significance of GI numbers or statements on the label. Many believe that low GI numbers imply health benefits for a food. For many, a high GI number implies that the food is full of sugar and is not good for them. While the scientific community understands that sucrose is moderate in GI, few consumers do. Further, for some consumers, a low GI claim means that the product is low calorie and helps promote weight loss. It was noted that classification of foods into categories of low, medium, and high would be easy for consumers, but carries risk of misclassification and the health effects of the three categories are not well detailed. There were concerns raised about the tables of GI values for food, since GI values for fit individuals and for diabetics are different from those of healthy individuals. However, the relative difference between different foods remains the same for both groups. Further, concerns were voiced that consumers fail to grasp that the GI of a food as found in the tables or listed on the label changes with cooking or handling of the food, so values may not represent the food as ingested. Despite these concerns, there was agreement that a database of GI/GL/glycemic glucose equivalent (GGE) values for European foods is needed. However, there was overall consensus product labeling was rife for consumer misinterpretation.

There were also points on which there was not agreement or where significant questions remain. There was not agreement on the actual measure that should be used to accurately and reproducibly measure the glycemic response. High on the list of concerns is that the method for glycemic index has a high standard deviation, even when it is measured under controlled conditions by experienced laboratories. There was also discussion about how long after ingestion of the glucose that the food should be measured. Some suggest that the standard two-hour area-under-the-curve measurement misses some important aspects that would be detected if a longer time period including a dip below the baseline was used. There was some support for measures such as GGE, which may be useful when talking about specific amounts of food. There are some who think that further investigation to improve the methodology is needed.

There is no agreement on what the potential label claims regarding GI should be. For example, there was discussion about possible label statements such as “lowers area under the curve” and what such a claim would imply. If claims were allowed, there is agreement that there should be a minimum amount of carbohydrate in the food. There was also lack of agreement about the usefulness of GI/GL of a specific food and how these numbers would relate to and predict the GI/GL of a meal with its varying amounts of carbohydrate, protein, and fat.

Participants of the workshop agreed that more research is needed on the following aspects of glycemic response:

- The effects of varying the types of carbohydrate while keeping the GL the same;
- The role of dietary GI/GL on gene expression;
- The role of dietary GI/GL on markers of inflammation;
- The role of varying levels of GI/GL in standardized clinical trials with specific health outcomes or markers;
- The level of glycemia that is “safe,” i.e., does not create a health risk for normal and diabetic populations;
- The importance of keeping insulin levels low and how this relates to glycemia;
- The potential benefits of sugar alcohols such as isomalt on HbAlC;
- The identification of intermediate markers that predict disease outcomes. For example, is it possible to have adequate data to say “that a decrease in the glycemic index by X% can reduce the risk of diabetes by X%?”
- Consumers’ reactions to varying label statements and claims about GI/GL; and
- Effective communication tools to use with consumers.

References


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