Spring 2009

Managing Blood Glucose with Local Nutrition Bars: A Collaborative Exploration

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INQUIRY journal
UNH UNDERGRADUATE RESEARCH JOURNAL SPRING 2009

research article

Managing Blood Glucose with Local Nutrition Bars: A Collaborative Exploration

—Naomi Crystal (Edited by Brigid C. Casellini and Kristin Lamy)

As a health conscious and busy college student, I always look for nutritious and convenient snacks. However, when I peruse the energy bar section of the grocery store, I usually find myself disappointed. So many packages grab my attention with health and nutrition claims yet so few hold any appeal after I read the ingredient labels. Most bars use added fiber, protein, or multivitamin powder as a substitute for higher quality whole grains, fruits, nuts and seeds. Fortunately, through my work in a University of New Hampshire nutrition lab, I recently discovered a health bar to end my search. Omega Smart is a small New Hampshire company that produces organic, whole food bars designed to address a variety of health concerns. These fruit-based bars are rich in antioxidants, omega–3 fatty acids and fiber, and contain no refined sugar, preservatives, artificial colors, flavorings, or other additives. For me, that is a recipe for success.

With funding from a 2008 Summer Undergraduate Research Fellowship (SURF) from the University of New Hampshire, I set out to research the blood glucose response to Omega Smart bars with the purpose of providing valuable health information to other consumers. By no means did this decision sentence me to a summer of solitude in the lab as one might expect. Our lab was always bustling with the activity of my research subjects and the other student researchers. The owner of Omega Smart, Virginia Jawidzik, my faculty mentor, Dr. Joanne Curran–Celentano, as well as a lab technician and two other students were very involvd in my research, contributing their time and energy to make my project a success. In the end, I determined the Glycemic Index (GI) of several Omega Smart bars and established agreement between two methods of testing.

The author hard at work pricking the fingers of her research volunteers for an experiment in blood glucose response.

The Glycemic Index and You

Current nutrition research pays much attention to the causes and treatment of obesity and diabetes, twin epidemics that plague developed nations around the world. Dietary modes of treatment and other preventive care could greatly reduce the financial burden caused by these diseases and improve the quality of life for millions of affected individuals. Knowing the extent to which different foods produce a rise in blood sugar is particularly important to individuals with or at risk for diabetes.

Care for diabetes has always included careful dietary selections, particularly in regard to carbohydrates. Because diabetics have impaired carbohydrate metabolisms, they must closely monitor their carbohydrate

intake to keep their blood glucose levels within the normal range. However, not all carbohydrates affect blood glucose levels in the same way. Those carbohydrates that are digested and absorbed quickly produce a rapid rise in blood glucose. Carbohydrates that are more slowly digested produce a gradual rise in blood glucose levels that allows for better glucose management.

In 1981, scientists established a system of ranking carbohydrate–containing foods based on their blood glucose raising potential (Jenkins 1981). This was termed the Glycemic Index (GI). Foods with a high GI are quickly digested and cause a rapid rise in blood glucose. Low GI foods are digested more slowly and produce a minimal rise in blood glucose. Good glucose control is better maintained by consumption of low GI foods, making them favorable choices for individuals with diabetes (Ludwig 2002 and Riccardi 2008).

Not only does a low GI diet help manage diabetes, it also reduces the risk of developing type 2 (adult onset) diabetes as well (Villegas 2007 and Willet 2002). This is because even in healthy individuals, high GI foods produce a dramatic rise in blood glucose, which puts stress on the body's carbohydrate metabolizing systems. A diet consisting of predominantly low GI foods therefore preserves the integrity of these systems (Ludwig 2002 and Riccardi 2008).

Maintaining steady blood glucose levels is also important in the prevention and treatment of obesity. Blood glucose monitoring systems in the brain respond to low blood glucose levels by producing hunger signals. Low GI foods delay hunger because their slow digestion sustains adequate blood glucose levels for a longer period of time (Brand–Miller 2002 and Ludwig 2002).

Low GI diets have also been associated with reduced risk of cardiovascular disease, age–related macular degeneration, and many forms of cancer including thyroid, breast, ovarian, prostate and gastric cancers (Augustin [prostate] 2004, Augustin [gastric] 2004, Beulens 2007, Chiu 2007, Kaushik 2008, Leeds 2002, Pi–Sunyer 2002, Randi 2008, Sieri 2007 and Silvera 2007). As a result of all these benefits of consuming a low GI diet, food manufacturers have become very interested in GI testing and food labeling.

Connecting with Omega Smart

Virginia Jawidzik has been interested in the GI of foods since she started making homemade bars as a snack for her diabetic husband, Ron, in 1999. When he ate Ginny's bars, Ron's blood sugar levels remained steady. The bars grew in popularity with Ginny's friends and family and in 2002 expanded into a business. Because of the Jawidziks' personal and business interest in diabetes, they contacted Dr. Joanne Celentano, a professor of nutrition at UNH, to seek her help in establishing the GI of their bars. In 2007, Dr. Celentano's lab and Omega Smart were awarded a Granite State Technology Innovation Grant by the NH Industrial Research Center (IRC) to perform GI testing.

In the pilot project, I served as a human subject and researcher, and performed extensive literature searches on the Glycemic Index to educate myself on the topic and testing protocol. My lab mates and I spent many early mornings in the lab cheering on our research volunteers as they tried to finish two substantial bars in the allotted fifteen minutes. Then we pricked their fingers to get a blood sample in order to determine their glucose levels. The study was a great success. We were able to establish the GI of the Omega Smart Pineapple bar to be within the low range, a fact that the company could use in its marketing efforts.

Due to the success of the first study, we decided to establish the GI of additional Omega Smart products, and my SURF project was born. The nutritional composition of the new products required that a larger portion size be consumed by the subjects during testing. Many subjects had difficulty consuming the required portion in the previous study so it did not seem feasible to increase it. Therefore we decided to use a slightly different testing protocol and, at the same time, provide evidence for agreement between the two methods. We proposed to re–test the Pineapple bar using a smaller portion and compare the resulting GI to that established in the pilot study. We would also complete GI testing on the new products using the smaller portion size method.

GI Testing and Results of Method Comparison

To conduct GI testing, I served ten research volunteers white bread on three separate occasions and then monitored their blood glucose levels for two hours. On three subsequent visits of each volunteer, I served them different nutrition bars and monitored their blood glucose levels as before. I plotted their blood glucose levels over the two hour period and determined the area under the response curve. (See Fig. 1) I then compared each volunteer's blood glucose responses to the nutrition bar to his/her responses to white bread, and calculated the GI from those numbers. GI = (area under response curve for nutrition bar/area under response curve to white bread) x 100. Low GI foods come in under 55, mid GI foods fall between 55 and 70, and high GI foods have values over 70.

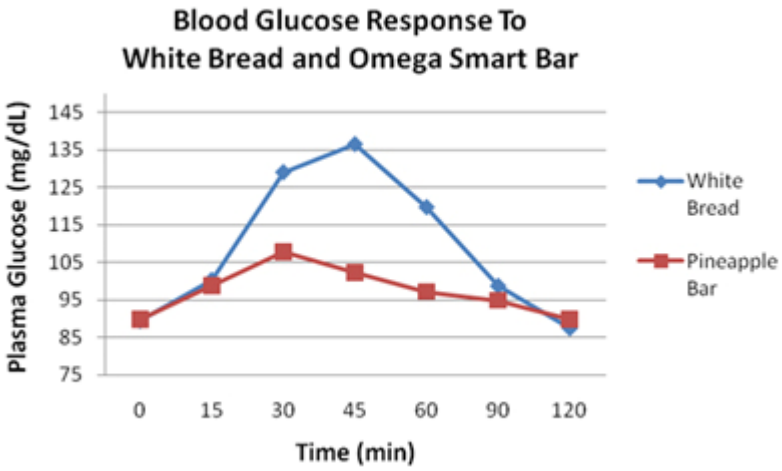

Figure 1: Graph demonstrating the rise in blood glucose induced by consuming equal portions of either a high GI (white bread) or low GI (Omega Smart bars) food. The area under the blue line represents the response to the white bread and the area under the red line represents the response to the pineapple bar.

The serving size was based on the amount of available carbohydrates in the food, which is calculated from the nutrition label as the total carbohydrates minus fiber because fiber is indigestible. In the pilot study the serving size was 50g of available carbohydrates. In this study, we chose to use 25g portions so that the participants didn't have to consume as much food in one sitting. That translated to one or more bars depending on the flavor, as all the Omega Smart bars do not have identical nutritional profiles.

Using the 25g method, I determined the GIs of the pineapple, cherry, and blueberry bars to all be in the low range. This will allow Omega Smart to label their bars as low GI, which will help educate consumers and presumably increase the company's sales. I also found that the GI of the pineapple bar determined using the 25g method was very similar to that obtained using the 50g method in the previous study. This provides evidence for agreement between the two methods, information that will be useful for other GI researchers.

Ongoing Research

Completing the GI project with Omega Smart opened the door for me independently to assist them in a new business venture. Many consumers use bars as convenient and healthy meal replacement options. However, all bars currently on the market from Omega Smart and other manufacturers are sweet, and this limits their use as meal replacements. A savory meal replacement bar could be a great addition to the market, as it would allow for the incorporation of vegetables and also provide a greater variety of flavors. With the help of Omega Smart, I am now developing this type of bar for my senior thesis project. I am altering their current bar recipe to be more savory in flavor and am incorporating three or more servings of vegetables. A panel of taste testers is evaluating the bars and making suggestions for improvement. Once I create a savory vegetable bar that is favorably evaluated by the taste testers, Omega Smart will scale up my recipe for production in their facility. If all goes well, a delicious savory bar should be added to the market in the near future.

Beyond the Lab

This project wasn't important to me just as a source of a paycheck or resume builder; it gave me the opportunity to help a local company document important nutritional information that will educate its consumers and in turn grow a business I believe in. Some of the other benefits of being involved in this research project actually had little to do with my study. I had the privilege of working in a lab with students involved in different projects,

and through weekly meetings and daily contact we learned about each other's topics. We bounced ideas off each other and worked through problems over cups of tea. My work and studies with the nutrition faculty, staff, and other students at UNH have taught me to recognize not only the quality nutrition of the Omega Smart bars but also the importance of supporting local business and organic farming practices. I consider it a great privilege that my research is being used to help Omega Smart grow their business and raise consumer awareness about an important health concern.

Foremost thanks go to Dr. Joanne Curran–Celentano, who has mentored me in this project and in all my previous laboratory experience, guiding and challenging me to improve at every step. Many thanks also to Susan Jalbert, who taught me lab techniques and supplied the lab with a much needed listening ear and jar of chocolate. Thank you to my other lab mates, Kate Rocheford and Hilary Snyder, for sharing their research with me and contributing helpful ideas to mine. Virginia Jawidzik and Omega Smart, thank you for supplying me with bars for my study and snacking, and for your enthusiasm for this project. My research volunteers have my deep appreciation for their dependability and pleasant company.

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Author Bio

Naomi Crystal*'s life is focused on fitness and health. Off the University of New Hampshire campus, Naomi is a cross country and track coach at Portsmouth Christian Academy, and she recently became certified with the Aerobic and Fitness Association of America. On campus, Naomi, a member of the Honors Program, is pursuing a Bachelor of Science in biochemistry with plans to graduate in May 2009. She spent two summers working in Dr. Joanne Curran-Celentano's lab researching Omega Smart nutrition bars, and though this may not seem directly related to her goal of working in the fitness industry, Naomi says "[the project] increased my exposure to nutrition concepts and the nutrition industry which is important for anyone working in the health or fitness fields." Naomi also enjoyed helping a local business. Plus, she added, "I love the bars so it was a nice bonus to get to eat them." Naomi will begin the master's program in kinesiology at UNH next fall.*

Mentor Bio

A frequent mentor to students writing research articles for Inquiry, Dr. ***Joanne Curran–Celentano*** *has been a tenure track faculty member at the University of New Hampshire since 1986. She is a professor in the Department of Molecular, Cellular, and Biomedical Sciences, specializing in human nutrition. Dr. Curran–Celentano has mentored more than a dozen students involved in research at the University, a job she finds very rewarding both for herself and for her students.*