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Glycemic Index (GI) Scores for USANA's Chocolate, Vanilla and Strawberry Nutrimeals

Dr. Tim Wood and Toni McKinnon RN, CCRP
USANA Health Sciences, Inc. Salt Lake City, UT, USA

Introduction

The glycemic index (GI) was developed to rank different foods according to the extent to which they increase blood glucose following ingestion (1). Foods with high GI scores contain rapidly digested carbohydrates and produce large rises and falls in blood glucose. Foods with low GI scores contain slowly digested carbohydrates that produce gradual and relatively low rises in blood glucose. GI scores are now being used in scientific research to examine the role of glycemic stress in defining the risk of certain diseases. A growing body of research has shown that long-term consumption of a high glycemic diet, increases the risk of developing diabetes, heart disease and colon cancer (2, 3). GI scores are also useful in designing weight and eating management programs (2, 4, 5, 6).

The objective of this study was to evaluate the GI scores for USANA's three Nutrimeal products; Dutch Chocolate, French Vanilla, and Wild Strawberry Nutrimeals (updated 2005 formulas).

Methods

This study was conducted using an internationally recognized methodology for measuring Glycemic Index (9). Ten healthy subjects were recruited. Each completed four test sessions; one involving the reference food (glucose solution) and three involving the test foods (USANA's Dutch Chocolate, French Vanilla, and Wild Strawberry Nutrimeals). At each session, subjects reported in the morning to USANA's research center in a fasting state (10-12 hr overnight). Subjects completed a baseline fullness rating and their fasting blood glucose was measured on blood obtained from a finger puncture. A One Touch Ultra® Blood Glucose Meter (Johnson and Johnson) was used. Subjects then consumed a fixed amount of a test food or reference food. In each case, the test and reference foods supplied 25 g of available (digestible) carbohydrate (while total carbohydrate varied by formula). Nutritional characteristics for the servings of reference and test foods are given in Table 1. Subjects were then required to remain seated and refrain from additional eating and drinking for the next two hours. Additional blood glucose measurements were taken 15, 30, 45, 60, 90 and 120 minutes after the test meal. Additional fullness ratings were completed after each blood measurement. Results were used to plot 2-hr blood glucose response curves, and the Area Under the Curve (AUC) for each plot was calculated. (AUC's indicate the magnitude of the total blood glucose response.) The GI scores for the test foods were calculated by dividing the appropriate 2-hr blood glucose AUC value by the subject's average 2-hr blood glucose AUC value for the reference food (glucose solution) and multiplying by 100 to obtain a percentage score.

Table 1. Characteristics of the test foods.

Food	Energy (Kj)	Protein (g)	Fat (g)	Total Carb (g)
Glucose Reference	400	0.0	0.0	25
Chocolate Nutrimeal	990	15.5	7.2	33
Vanilla Nutrimeal	990	15.5	7.2	33
Strawberry Nutrimeal	960	15.5	7.0	33

Results

Table 2 shows the time courses for the average blood glucose levels across the 10 subjects for the reference food and three test foods. Figure 1 plots this data and shows the average (10 subjects) two-hour blood glucose response curves following consumption of the reference and test foods. USANA's three Nutrimeal formulas all have similar macronutrient contents (i.e. they contain very similar amounts of carbohydrate, protein, fat and fiber per serving). As such, they yielded very similar glucose response curves that were markedly lower in amplitude than that given by the glucose reference meal.

AUC analysis based on the above glucose response curves (Table 3) yielded Glycemic Index scores of 24 for Dutch Chocolate Nutrimeal, 19 for French Vanilla Nutrimeal, and 26 for Wild Strawberry Nutrimeal (relative to the standard GI score of 100 for the glucose solution). Because the base formulas for the three products are virtually identical and because their individual GI scores are so similar (within the limits of precision of the test) we conclude that the most reasonable approach is to assign the average score of 23 to all three formulas.

Discussion

The Glycemic Index scale (0-100%) is continuous. Nevertheless, a food is considered high glycemic if its GI score is greater than 70, moderately glycemic if its GI score is between 55 and 70, and low glycemic if its GI score is less than 55 (7). Results from the study reported here show that USANA's Dutch Chocolate, French Vanilla, and Wild Strawberry, with an average GI score of 23, are all very low glycemic foods.

The low Glycemic Index scores for these three formulas are the product of several features. First, Nutrimeals are balanced macronutrient formulas, providing balanced amounts of carbohydrate, protein and fat. Protein and fat will reduce the Glycemic Index of a food. Secondly, the major sources of digestible carbohydrate in the Nutrimeal formulas (e.g. fructose) are low glycemic ingredients. Third, the three Nutrimeals provide significant dietary fiber (8 g per serving), and fiber is known to generally lower the Glycemic Index of a food, probably by slowing the absorption of sugars in the gut. It is not surprising then, that all of USANA's Nutrimeal products are low-glycemic.

Regular use of USANA's Dutch Chocolate, French Vanilla, and Wild Strawberry Nutrimeals should help people improve the glycemic characteristics of their diets. Furthermore, over the long-term, regular use of these products, as part of a healthy, well-balanced diet, should help to reduce the negative health consequences associated with high GI diets.

Acknowledgment: This study was conducted at USANA Health Sciences, Inc. using normal, healthy volunteers, all of whom were employees of the company.

References

(1) Jenkins DJA et al. 1981. Glycemic index of foods: a physiological basis for carbohydrate exchange. Am J Clin Nutr 34: 362.
(2) Joint FAO/WHO Report. 1998. Carbohydrates in Human Nutrition. FAO Food and Nutrition, Paper 66. FAO, Rome.
(3)Favero A, et al. 1999. Energy sources and risk of cancer of the breast and colon-rectum in Italy. Adv Exp Med Biol 472:51.
(4) Brand-Miller JC. 1994. The importance of glycemic index in diabetes. Am J Clin Nutr 59: 747S.
(5) Slabber M, et al. 1994. Effects of low-insulin-response, energy-restricted diet on weight loss and plasma insulin concentrations in hyperinsulinemic obese females. Am J Clin Nutr 54: 846.
(6) Holt S, et al. 1995. A satiety index of common foods. Eur J Clin Nutr 49: 675.
(7) Brand-Miller JC, et al. 1998. The G.I. Factor. Hodder Headline, Sydney NSW. 252 pp.
(8) Gallaher DD and BO Schneeman. 2001. Dietary Fiber. Pp. 83-91, In Bowman BA and RM Russell. Present Knowledge in Nutrition, 8th Ed. ILSI Press, Washington, DC.
(9) Wolever TMS, et al. 2003. Determination of the glycaemic index of foods; interlaboratory study. Eur J Clin Nutr. 57: 475.

Table 2. Average blood glucose concentration at various times following the ingestion of the four reference / test meals.

	Average Blood Glucose Level (mg/dl)						
Time (min)	0	15	30	45	60	90	120
Glc-25g (Reference)	88	115	135	123	105	85	83
Strawberry Nutrimeal	86	95	94	86	88	87	87
Chocolate Nutrimeal	87	95	96	91	89	84	87
Vanilla Nutrimeal	91	102	93	89	88	91	90

Table 3. Glycemic index scores for the three Nutrimeal products calculated from Area Under the Curve data. Because the formulas and GI scores for the three Nutrimeals are so similar, the average score of 23 may best represent their true Glycemic Index.

Fibergy	GI Score
Strawberry Nutrimeal	26
Chocolate Nutrimeal	24
Vanilla Nutrimeal	19
AVERAGE	23

Figure 1. Time courses for the average blood glucose concentrations (Table 2) in graphic form.