

**Do Type II Diabetics Show Individual Grain-specific Elevations  
in Blood Glucose?**

**Faculty Development Grant**

**Report of Research Progress**

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### Purpose

The purpose of this study was to determine whether Type II (insulin resistant) diabetics showed individual patterns of blood glucose (**bg**) elevation depending on the type of the food rather than the caloric content. The study was designed to determine the impact of three grains: wheat, rice, and corn, on **bg** elevations. This data was compared to **bg** elevations when glucose or no food were consumed. The focus was to determine if individuals responded differently to the three grains, and if that were true, to identify individual response patterns. The importance is that there is published information suggesting that all individuals are expected to have the same **bg** response to each of these grains. In fact, the Glycemic Index Diet is a commercial diet built on this premise. However, if individual responses differ, then education for diabetics should include testing for individual patterns rather than simple “rule-of-thumb” advice about foods to avoid.

### Significance

Type II diabetics must control dietary intake of carbohydrates which directly impact the amount of the sugar, glucose, in the blood stream. One method of predicting the effect of different foods (including whole grain starches which are the focus of this research) on **bg** levels is to consult published Glycemic Index (**GI**) values. **GI** values are calculated by comparing the elevation in **bg** caused by 200 calories of a given food with the elevation obtained from 200 calories of glucose. The higher the **GI**, the greater the rate of elevation of **bg** by a particular food. For example, if food A has a **GI** of 100, it elevates **bg** twice as rapidly as food B with a **GI** of 50.

Because **GIs** are often the best available indication of different foods' effects on **bg**, they are often used as set-in-stone guidelines by diabetes counselors. However diabetic friends and relatives report individual responses not predicted by the **GI**. Consequently we designed a study to determine whether diabetic's responses to three different whole grains: wheat, corn and rice, were indeed individual with the intention of recommending new educational plans for recently diagnosed diabetics.

#### Method of Procedure

**Subjects:** Ten subjects have completed the study. The goal is a minimum of twenty subjects. We anticipate that this goal will be accomplished by the end of the academic year. The data from the subjects who have completed the study has been analyzed for general trends. These findings are described under the Results to Date section. Unanticipated difficulties encountered in the recruitment process have required more aggressive outreach efforts. Based on our visits to diabetic support groups, retirement homes, and other contacts with individual diabetics, it has become clear that systematic testing by diabetics is not prevalent, in fact, it appears to be a rarity. Testing is viewed as too difficult and uncomfortable. This is an area which might benefit from more extensive educational efforts. Behavioral control is clearly a problem in the treatment of diabetes. Helping diabetics learn 'how to' learn about themselves is a worthy and difficult goal. We hope to get some insights into these areas from our questionnaires.

**Procedure:** Fasting subjects (no food for the past 4 hours) tested their own **bg** levels at baseline then at 20-minute intervals for one hour and twenty minutes following ingestion of 200 calorie portions of glucose, wheat chex, corn chex or rice chex

respectively, or no food at all. Subjects were asked initially to test each of the 5 treatments (3 grain products, glucose, no food) 4 times for a total of 20 trials. However, early examination of results showed subject's responses to be nearly identical from test to test, so testing was reduced to 10 trials (two of each permutation) with baseline testing followed by retesting at 60 and 80 minutes respectively.

#### Results to Date:

Table 1 summarizes individual responses to the three grains when compared to the **bg** elevation of glucose. In principal the greatest response should be to glucose which is set at 100% response. The grain responses are then reported as a percent of the increase for glucose with the greatest grain response shown in bold. The smaller the increase, the smaller the percent change. Surprisingly, subject C showed a higher **bg** elevation from eating both rice and corn than from pure glucose alone, and subject J showed a higher response from corn. The difference in the level of response by individuals was great. Subjects D and E had little response to any of the treatments, while subjects B and H had quite large **bg** elevations with all treatments.

According to the Glycemic Index literature, the expected pattern of response should have been greatest with rice, then corn, then wheat. Examination of Table 1 shows that each of the grains produced the greatest impact for about one-third of the subjects. We will continue to examine the diversity of response patterns by individual as we recruit the remainder of our subjects and gather more data.

Table 1  
Comparison of Subject Responses to Published Glycemic Index Results  
(Data for the Subjects is the Average Increase At One Hour after Consumption  
of Grains as a Percent of Increase for Glucose)

Subject Number	Glucose	Corn	Wheat	Rice
Glycemic Index (Average Increase as Percent of Glucose Increase)	100	81	74	87
Subject A	100	53	55	90
Subject B	100	79	84	77
Subject C	100	115	87	134
Subject D	100	97	58	79
Subject E	100	83	(-28)	43
Subject F	100	76	37	77
Subject G	100	65	82	68
Subject H	100	80	72	70
Subject I	100	71	85	82
Subject J	100	120	80	84