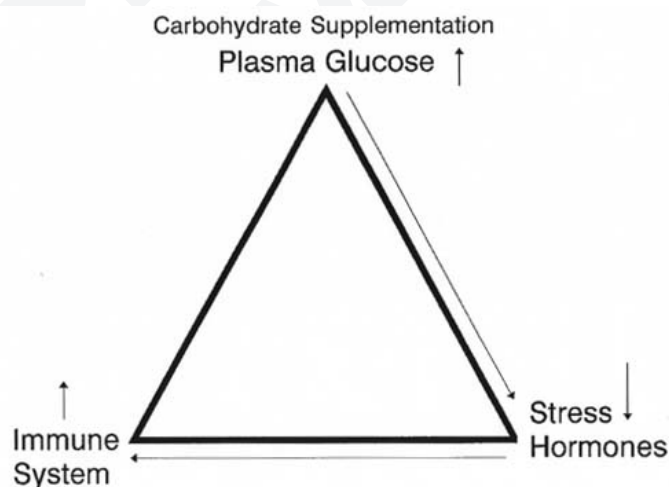


Carbohydrate supplementation and the hormonal and immune response to 2.5 hours of running

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As a part of a larger study funded by the Gatorade Sports Science Institute, I agreed to add on four subjects to test the effect of GlycoMax supplementation on the hormonal and immune response to 2.5 hours of running. The 30 original subjects were randomized to Gatorade and placebo groups, with treatment double blinded. It was agreed that a limited number of variables on just four GlycoMax subjects (non-randomized volunteers) would be measured to provide pilot data for direction in future research endeavors. Subjects in the Gatorade and placebo groups were given 0.75 liters of beverage 15 minutes prior to running 2.5 hours, during which they were fed 0.25 liters every 15 minutes. The Gatorade subjects received 150 grams of carbohydrate during the run, while placebo subjects received none. We followed a carefully described schedule of supplementation for the GlycoMax runners which resulted in just 22 grams of carbohydrate ingestion during the entire run, with additional drinks given just prior to and following exercise. As indicated by the **triangular figure**, our hypothesis was that carbohydrate versus placebo supplementation would maintain plasma glucose at higher levels, attenuating increases in blood stress hormone levels and stressful perturbations in the immune system.



Please notice from the attached table that the subjects were well conditioned, experience marathon runners, who were able to maintain a high intensity of effort for 2.5 hours on treadmills at the Appalachian State University Human Performance Laboratory. The respiratory exchange ratio for the Gatorade runners was significantly higher than in placebo and GlycoMax runners indicating that they were burning more carbohydrate during the run. Also notice that the Gatorade and placebo runners lost little weight as result of the run, while the GlycoMax runners lost 3.8 pounds on average [1](#).

*Subject Characteristics and 2.5-h Run Performance
Carbohydrate Supplementation and the Immune Response to Heavy Exercise*

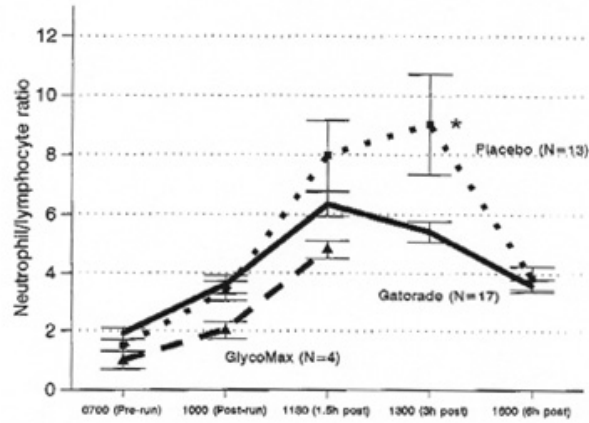
Characteristic	Placebo (N=13)	Gatorade (N=17)	GlycoMax (N=4)
Age, yr	42.9±2.3	40.5±1.8	42.8±3.4
Body fat, %	12.9±0.9	13.9±1.1	13.4±1.7
VO ₂ max, ml/kg/min	52.9±1.5	51.8±1.4	55.1±4.3
Marathon PR, min	201±5	201±5.5	192±8
%VO ₂ max	77.2±0.6	76.2±0.5	74.5±2.6
%HRmax	84.9±0.7	86.1±0.7	87.8±1.2
Average RER	0.89±0.01	0.93±0.01*	0.90±0.02
Weight change, lb	0.8±0.5	0.7±0.4	3.8±0.8*

The three charts reveal that plasma glucose was highest in the Gatorade runners post-run, followed by GlycoMax, and then the placebo runners. The stress hormone cortisol was highest in the placebo group, as was the neutrophil/lymphocyte ratio, an important marker of stress to the immune system.

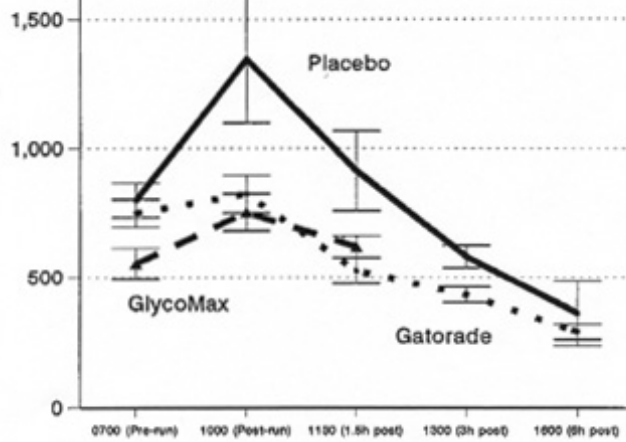
My overall interpretation of the data is that further research is warranted to measure to the influence of varying carbohydrate concentrations of Glyco Max on the hormonal and immune response to intensive exercise. I believe that the feeding schedule should involve a greater total fluid delivery to avoid weight loss during the exercise bout. GlycoMax was able to achieve plasma glucose, cortisol, and neutrophil/lumphocyte levels comparable to Gatorade despite a lower delivery of total grams of carbohydrate. However, the data do indicate that a greater amount of carbohydrate ingestion by GlycoMax runners would result in even more favourable reponses. I propose that in the next study, two different fluid/carbohydrate delivery schedules for GlycoMax be used, and compared to placebo and Gatorade groups. This should help Booth Designer Foods develop a product that optimized blood glucose, hormone, and immune responses during heave exertion.

* p<0.05 versus other groups; Nieman DC, Dept HLES, Appalachian State University, Boone, NC 28608

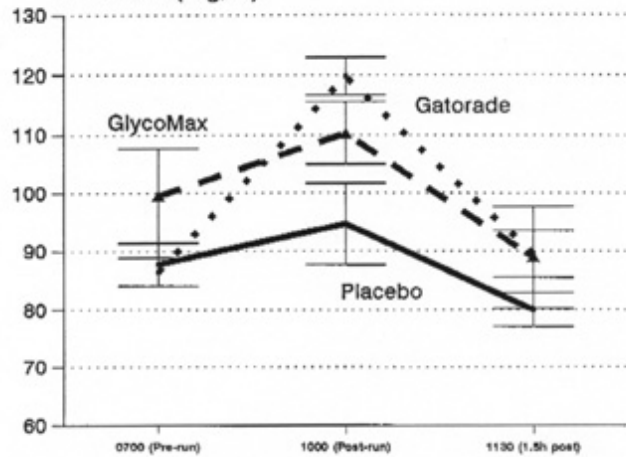
Neutrophil/Lymphocyte Response to 2.5h of Running



Cortisol (nmol/L)



Glucose (mg/dl)



Appalachian Study, Footnotes

1: Note that Gatorade athletes consumed 32oz. of liquid every hour, while GlycoMax® athletes consumed 24oz. of liquid per hour. It is a known fact that the gut can pass a maximum of 32oz. per hour. It should be noted that not all athletes can consume this amount due to their own physical structure and may be a detriment to their performance. Although strictly from a scientific position one may lose several pounds of weight from insufficient hydration, individuals who try to maximize hydration may sacrifice performance due to inability to maintain the fluid in the body (throwing up). Also, some athletes, such as football players, should not consume large amounts of fluid due to the high degree of physical contact. Time Released Energy™ helps address this issue. Glucose is known to pull oxygen and help maintain hydration, a plus for all athletes.