

**Grown By Nature's B.I.O.
Comparative Glyco-Phos™ and Glucose/Fructose study
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Purpose

The aim of this study is to compare the effect of ingestion of equal quantities of glucose and fructose alone or in the commercial preparation "Glyco-Phos™" on human plasma glucose concentrations.

Protocol

Two different groups of volunteers took part in this investigation with informed consent. The glucose/fructose group consisted of 8 volunteers (4 males and 4 females) between the ages of 18 and 20. The Glyco-Phos group was 6 individuals (3 males and 3 females) ages 25-52. Each subject fasted for 10 hours and appeared in the morning for the study. Each subject ingested 7.5g of carbohydrates (5.25g of glucose and 2.25g of fructose) alone (Glucose/Fructose group) or in a 30ml commercial energy supplement liquid Glyco-Phos. The supplements were diluted to 100ml with water. Finger-prick blood samples were taken at 0, 0.5, 1.0, 1.5, 2.0, 2.5 and 4.0 hours. The blood was converted to plasma and analysed colorimetrically for glucose using a commercial hexokinase enzyme kit from Sigma Chemical company.

The average results for the two groups are shown in tables 1 and 2 and in the figure. Significance was measured by a two-tailed t-test.

Discussion

From Table 1, there was no significant difference between the two groups at time 0, 0.5 and 1.0 hours. However, the Glyco-Phos gave significantly greater plasma glucose at later times, including the last drawing at 4.0 hours. Looking at the figure, it is apparent that the Glucose/Fructose group had a hypoglycaemic condition after 4.0 hours. This is a potentially hazardous situation in which the brain is deprived of glucose and mental function can be impaired and if the hypoglycaemia is severe enough, the individual could pass out. The Glyco-Phos produces no hypoglycaemia. In fact, the plasma glucose after 4 hours is significantly greater ($p=0.02$) than the 0 hour value indicating the plasma glucose had not returned to the baseline value. From the individual curves, the time for maximal plasma glucose was calculated. The Glyco-Phos group peaked at 1.94 ± 0.56 which was significantly greater ($p=0.0001$) than the Glucose/Fructose group which peaked at 0.67 ± 26 hours.

The areas under the curves were calculated using a manual planimeter. The area is indicative of glucose absorption and metabolism. The individual areas are shown in Table 2. The Glyco-Phos group has over a four-fold greater area ($p<0.0001$) than the Glucose/Fructose group. These results indicate that upon absorption, the Glyco-Phos reaches the liver through the blood-stream and activates the enzymes that take part in the breaking down of glycogen stored in the liver to glucose (phosphorylase, transferase, α 1,6-glucosidase). The enzyme glucose 6-phosphatase must also become activated as this enzyme makes it possible for the glucose to leave the organ. These enzymatic functions all take part and are responsible for the high elevation of glucose in the blood, which is then available for energy production (ATP). The Glucose/Fructose group was older than the Glyco-Phos group. Since glucose tolerance decreases with age the results would have been even more different, as far as areas are concerned, with a younger Glucose/Fructose group.

Summary

The Glyco-Phos produced a greater plasma glucose than the Glucose/Fructose at all times except 0.5 hours. However, even at this time when the plasma glucose is at its maximum for Glucose/Fructose, the Glyco-Phos provides an equal concentration of glucose. Thus, Glyco-Phos is a better source of energy in the form of glucose for the long-term and equal to Glucose/Fructose as an energy source for the short term. The Glyco-Phos produces no hypoglycaemia and is overall the better supplement.

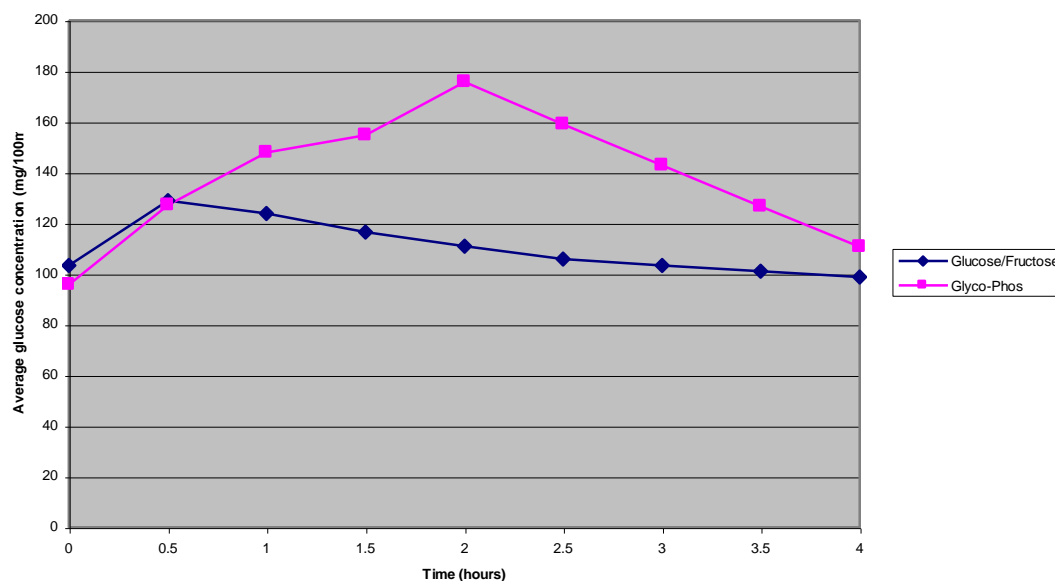
Table 1. Average glucose concentration in mg/100ml \pm standard deviation in plasma of subjects taking either glucose/fructose or Glyco-Phos.

Time (hrs)	Glucose/Fructose	SUPPLEMENT	
		Glyco-Phos	Significance
0	103.4 \pm 3.2	95.7 \pm 14.7	NS*
0.5	128.8 \pm 11.3	127.0 \pm 9.2	NS
1.0	123.7 \pm 13.2	147.8 \pm 10.0	NS
1.5	116.5 \pm 5.5	154.7 \pm 9.0	p=0.002
2.0	111.0 \pm 5.7	175.7 \pm 14.3	p=0.002
2.5	105.7 \pm 6.2	158.9 \pm 14.5	p=0.005
4.0	98.8 \pm 4.0	110.7 \pm 4.8	p=0.03

*NS = not significant (p>0.05)

Table 2. Average areas \pm standard deviation under plasma glucose concentration – time curve for subjects ingesting glucose/fructose or Glyco-Phos.

Subject	Areas Under Glucose Curve	
	Glucose/Fructose	Glyco-Phos
1	100	355
2	72	234
3	10	208
4	64	150
5	91	185
6	40	318
7	--	278
8	--	143

Fig. 1. Plasma glucose after different supplements

Addendum to Glucose/Fructose Study

Protocol

Six subjects took part in this study. They ranged in age from 25-47. Each subject appeared fasting for a baseline blood drawing and then took 7.5g of carbohydrates (5.25g of glucose and 2.25g of fructose) in 100ml of water as in the glucose/fructose study. Then sampling occurred periodically until 4 hours later. The blood was converted to plasma and analysed colorimetrically for phosphorus by a commercial kit from Sigma Chemical Company.

Results and Discussion

The results are shown in the following table:

Time (hrs)	Plasma phosphorus (mg/100ml)
0	2.3 ± 0.37
1.0	2.39 ± 0.47
1.5	2.10 ± 0.39
2.0	2.24 ± 0.34
2.5	2.47 ± 0.34
4.0	2.33 ± 0.33

The glucose/fructose as expected caused no significant changes in plasma phosphorus as this product contained no phosphorus.