PLASMA GLUCOSE AND INSULIN RESPONSE TO HIGH PROTEIN ORAL NUTRITIONAL SUPPLEMENTS IN ADULTS WITH TYPE 2 DIABETES MELLITUS

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BACKGROUND & OBJECTIVES

- Nutrition is a key aspect of overall diabetes management, and current recommendations focus on an individualized approach to diet planning.[1] While the amount and type of carbohydrates in the diet generally receive the most attention, higher protein diets may have beneficial effects on blood glucose management and other outcomes.[2]
- Diabetes-specific oral nutritional supplements (ONS) are typically moderate in protein content (7-16 g/serving). While many high protein ONS are commercially available, the impact of these beverages on blood glucose levels is generally unknown.
- The objective of this clinical trial was to evaluate the glycemic and insulin responses of standard ONS compared to isocaloric amounts of three high protein ONS in individuals with type 2 diabetes.

METHODS

- Fourteen adults with type 2 diabetes were enrolled in this randomized, controlled, cross-over trial. Participants consumed three high protein ONS: one with 120 kcal/svg (BOOST Glucose Control® High Protein Drink) and two with 240 kcal/svg. Test products were compared to isocaloric amounts of standard ONS (120 and 240 kcal/svg controls). Nutritional profiles of the 5 test products are shown in **Table 1**.
- Blood glucose and serum insulin values were measured at baseline and 10, 20, 30, 60, 90, 120, 150, 180, 210 and 240 min after each product was consumed and used to calculate area under the curve (AUC), peak (C_{max}) blood glucose and insulin concentrations, and time of C_{max} (T_{max}). First-phase insulin response ($AUC_{0\text{-}30\ min}$) and an insulinogenic index were also calculated.

Table 1. Nutritional profile of test beverages

	120-C (Control 1)	120-HP	240-C (Control 2)	240-HP1	240-HP2
Volume, mL	118.5	237	237	267	289
Calories	120	120	240	240	240
Protein, g	5	22	10	24	24
Carbohydrate, g	21	2	41	21	20
Fat, g	2	2.5	4	6.5	7

120=120 kcal/svg; 240=240 kcal/svg; C=control; HP=high protein

RESULTS

- All 14 participants completed the study. Data for one subject were excluded due to unlikely blood glucose values, leaving 13 subjects (n=9 males, n=4 females; 62±7.2 years) included in the final analysis.
- As shown in **Figure 1 and Table 2**, mean blood glucose AUC and C_{max} for blood glucose were significantly lower for 240-HP1 and 240-HP2 vs. 240-C ($p<0.05$ for all comparisons).
- The C_{max} for blood glucose was significantly lower for 120-HP compared to 120-C ($p=0.03$), while blood glucose AUC did not differ (**Figure 2 and Table 3**). The mean glucose level at 30 minutes was significantly lower for 120-HP vs. 120-C ($p=0.002$).

Figure 1. Mean Blood Glucose change from Baseline Levels by Time of Sampling and Test Product (240 kcal/svg ONS)

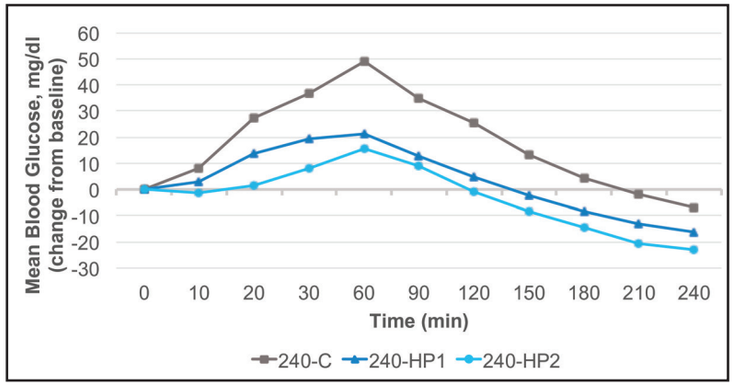
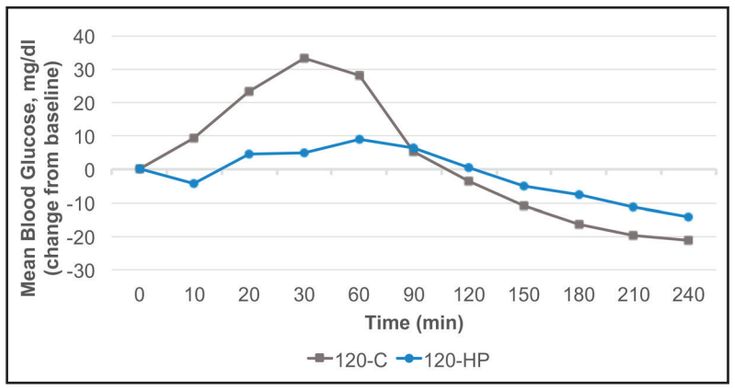


Figure 2. Mean Blood Glucose change from Baseline Levels by Time of Sampling and Test Product (120 kcal/svg ONS)



RESULTS

- Early-phase insulin response ($AUC_{0\text{-}30\ min}$) was significantly lower for 240-HP2 vs. 240-C ($p=0.04$), while other test products did not differ from the respective control.
- There were no differences in T_{max}, insulin $AUC_{0\text{-}240\ min}$, insulin C_{max}, or insulinogenic index for any of the high protein ONS compared to their isocaloric controls.

Table 2. Glucose and Insulin Responses for 240 kcal/svg ONS

	240-C (Control)	240–HP1	240–HP2
Glucose AUC, mg/dL	4734±6050	770±4206**	−779±3490**
Glucose C_{max}, mg/dL	194±50	170±37*	163±44**
Glucose t=30, mg/dL	166±42	160±36	150±38
Insulin $AUC_{0\text{-}240\ min}$, µIU/mL	2385±2440	2487±2071	1319±1598
Insulin $AUC_{0\text{-}30\ min}$, µIU/mL	356±447	376±385	**147±167***

*p<0.05 vs. control; **p<0.01 vs. control

Table 3. Glucose and Insulin Responses for 120 kcal/svg ONS

	120-C (Control)	120-HP
Glucose AUC, mg/dL	163±3952	−347±3336
Glucose C_{max}, mg/dL	178±32	**156±47***
Glucose t=30, mg/dL	171±34	**145±41****
Insulin $AUC_{0\text{-}240\ min}$, µIU/mL	349±2768	540±2280
Insulin $AUC_{0\text{-}30\ min}$, µIU/mL	159±313	80±364

*p<0.05 vs. control; **p<0.01 vs. control

CONCLUSION

High protein ONS attenuated the blood glucose response, as measured by glucose $AUC_{0\text{-}240}$ min and/or C_{max} for postprandial blood glucose concentrations, compared to isocaloric amounts of standard ONS.

High protein, lower carbohydrate ONS may be useful as a part of overall blood glucose management practices in individuals with type 2 diabetes.

REFERENCES

1. American Diabetes Association. *J Clin Appl Res Educ.* 2019;42(S1).
2. Dong JY, et al. *Br J Nutr.* 2013;110(5):781-789.

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