

GLYCEMIC AND INSULENEMIC RESPONSE TO FOUR DIFFERENT SWEETENERS IN HEALTHY INDIVIDUALS: A DOUBLE BLIND, RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: The non-nutritive sweetener, erythritol, does not change postprandial glucose levels. Whether this holds true for forms which are modulated to be more intensely sweet is not known.

Objectives: Comparison of the postprandial glucose and insulin responses of two erythritol products differing in sweetness intensity.

Methods: 15 healthy volunteers (6 M, 9F; 38±12 yr; 26.9±4.4kg/m²) consumed 4 test meals consisting of 24g sucrose, 24g erythritol (Swerve® Granular), 2.4g erythritol (Swerve® 10x) and 3g sucralose (Splenda®) mixed with 250ml of water. All meals were matched for sweetness level. Capillary blood samples were taken fasting and at 15, 30, 45, 60, 90 and 120 min after the start of the meal.

Results: Postprandial glucose and insulin levels were significantly lower after the non-nutritive sweeteners compared to sucrose at 15, 30 and 45 min. Glucose levels were also lower after both erythritol products compared to sucralose at 15 min. At 90 and 120min, glucose levels were significantly higher after the non-nutritive sweeteners compared to sucrose (p<0.001). Incremental glucose and insulin areas were significantly lower after the three non-nutritive sweeteners compared to sucrose (p<0.0001).

Conclusions: This study confirms that irrespective of sweetness level, consumption of erythritol does not raise postprandial blood glucose or insulin levels significantly.

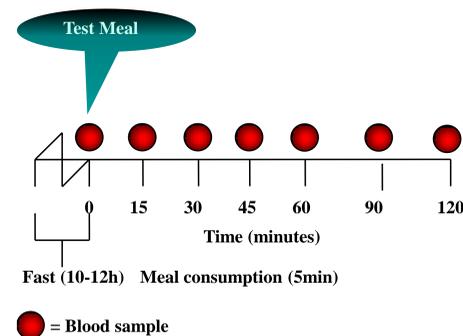
METHODS

Participant Characteristics

Participant Characteristics	All subjects (n=15)
Age	38 ± 12y
Gender	6M,9F
BMI	26.9 ± 4.4 kg/m ²
Fasting Blood Glucose	4.52 ± 0.06 mmol/L
Fasting Serum Insulin	4.4 ± 0.4 µU/ml

Design

Acute, double blind, randomized cross-over study with 4 treatments taken by each subject



Test Meals

Test foods consisted of 4 different sweeteners, matched for sweetness level, mixed with 250ml of water. Participants were also provided with an additional 250 ml water with each test meal.

Macronutrients

Test Meal	Weight (g)	Energy (kcal)	Protein (g)	Fat (g)	Total CHO (g)	Avail CHO (g)
Sucrose	24	96	0	0	24	24
Swerve® Regular (Erythritol)	24	0	0	0	23.04	0
Swerve® x10 (Erythritol)	2.4	0	0	0	2.3	0
Splenda® (Sucralose)	3.0	0	0	0	<3.0	0

RESULTS

Blood Glucose

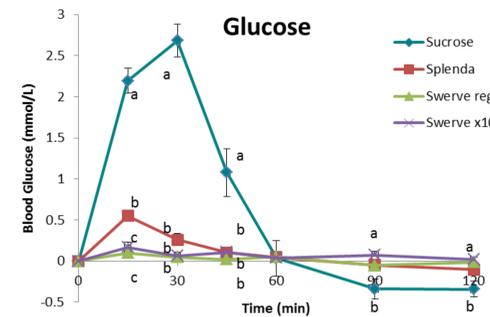


Figure 1: Postprandial incremental blood glucose measurements 4 different sweeteners balanced for sweetness. Results are expressed as Mean±SEM, and using ANOVA for main effects of time and test meal and the time×meal interaction. If the time×mean interaction was significant, then ANOVA was conducted for each time point using Tukey-Kramer method to adjust for multiple comparisons. Time points with different letters are significantly different (p<0.0001).

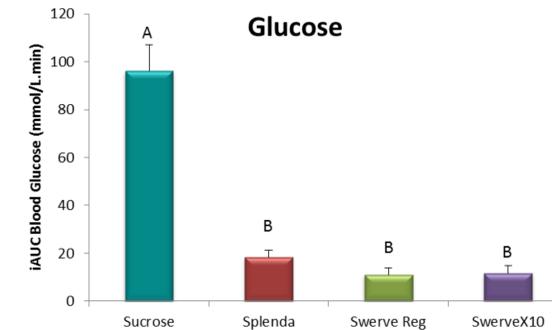


Figure 2: iAUC blood glucose measurements after 4 different sweeteners balanced for sweetness. Results are expressed as Mean±SEM, and using ANOVA for main effects of time and test meal and the time×meal interaction. If the time×mean interaction was significant, then ANOVA was conducted for each time point using Tukey-Kramer method to adjust for multiple comparisons. Bars with different letter are significantly different at p<0.0001

Serum Insulin

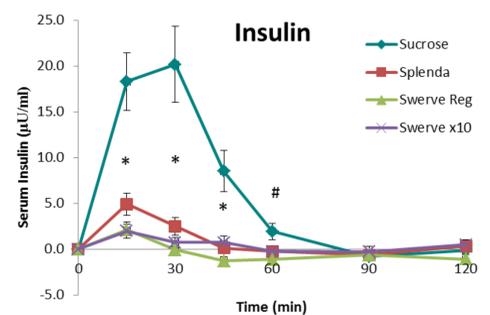


Figure 3: Postprandial incremental serum insulin measurements after 4 different sweeteners balanced for sweetness. Results are expressed as Mean±SEM, and using ANOVA for main effects of time and test meal and the time×meal interaction. If the time×mean interaction was significant, then ANOVA was conducted for each time point using Tukey-Kramer method to adjust for multiple comparisons. *significantly different from sucrose at p<0.001 ; # Splenda and Swerve regular significantly different from sucrose (p<0.01).

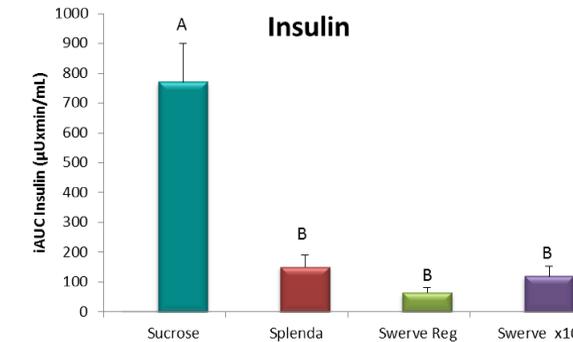


Figure 4: iAUC serum insulin measurements after 4 different sweeteners balanced for sweetness. Results are expressed as Mean±SEM, and using ANOVA for main effects of time and test meal and the time×meal interaction. If the time×mean interaction was significant, then ANOVA was conducted for each time point using Tukey-Kramer method to adjust for multiple comparisons. Bars with different letter are significantly different at p<0.0001.

Palatability

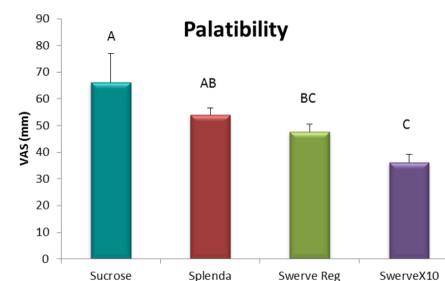


Figure 5: Palatability ratings for 4 different sweeteners balanced for sweetness. Results are expressed as Mean±SEM, and using ANOVA for main effects of time and test meal and the time×meal interaction. If the time×mean interaction was significant, then ANOVA was conducted for each time point using Tukey-Kramer method to adjust for multiple comparisons. Bars with different letters are significantly different (p<0.0001)

CONCLUSIONS

Blood glucose and serum insulin levels after the non-nutritive sweeteners were significantly lower compared to sucrose at 15, 30 and 45 minutes. In addition serum insulin levels were significantly lower after the Swerve regular compared to Sucrose at 60 minutes (p<0.01)

Glucose levels were significantly lower after both Swerve products compared to Splenda at 15 minutes.

At 90 and 120minutes, the blood glucose levels were significantly higher after the 3 non-nutritive sweeteners compared to sucrose (p<0.001)

Incremental glucose and insulin areas under the curve were significantly lower after the three non-nutritive sweeteners compared to sucrose (p<0.0001)

This study confirms that Erythritol does not significantly raise postprandial blood glucose or insulin levels irrespective of sweetness level.

Splenda acutely increases postprandial glucose levels to a small extent.

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