

The Influence of Carbohydrate Beverages on Salivary Neuropeptide Y and Dipeptidyl Peptidase IV Activity

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The focus of our study was to examine the activity and function of the serine protease Dipeptidyl Peptidase IV, also known as DPP-IV, in saliva. We know that DPP-IV is present in the blood because it inhibits GLP-1 in the gastrointestinal tract, which decreases the release of insulin from the pancreas. DPP-IV acts to alter the structure of neuropeptides, such as neuropeptide Y, which in turn, activates the Y2 receptors on the taste buds. Y2 receptors communicate with the hypothalamus in the brain to signal to the body that it is satiated, or full. For this study, we examined whether the introduction of carbohydrate beverages would change DPP-IV activity.

Our study used 28 healthy college students who each went through four separate trials. Each participant: (1) ingested 8oz Sierra Mist (2) ingested 8oz Diet Sierra Mist (3) swished 10ml Sierra Mist (4) swished 10 ml Diet Sierra Mist on four separate days. Saliva and a small blood sample were collected 10 minutes after the condition to test the activity of DPP-IV. After gathering the samples, we extracted the plasma from the blood and ran the plasma and saliva through a fluorescent assay to test for DPP-IV activity. We also tested blood glucose levels. All data were analyzed using a 1-way repeated measure ANOVA and post hoc analysis when appropriate.

Each line in Figure 1 represents an individual participant (*= p < 0.05 different from pre). Salivary DPP-IV decreased ($p < 0.05$) with the ingestion of regular (see Figure 1A) and diet soda (change from pre: $-8 \pm 8 \text{ U L}^{-1}$) and swish of regular soda ($-13 \pm 12 \text{ U L}^{-1}$), but not with the swish of diet soda. No change in plasma DPP-IV activity was observed with any of the conditions (for regular soda ingest see Figure 1B). We saw an increase in blood glucose with ingestion of regular soda (Figure 1C), but no change with diet soda or swish of regular soda. These findings suggest that sweetened beverages may result in a decrease in activation of the Y2 receptor on the taste buds and possibly a decrease in satiety. This decrease occurs with both diet and sugar-sweetened beverages.

Future research will examine studies related to the serine protease DPP-IV in the saliva. We are interested in macronutrients such as protein and the effect they have on DPP-IV activity. Conducting similar studies may lead to a discovery in the relationship between macronutrients and their influence on satiety. Ultimately we are interested in the function of DPP-IV in the saliva and how that function differs from the DPP-IV found in the plasma. Comparing DPP-IV activity influenced by differing nutrient sources may answer the question of which nutrients increase DPP-IV activity and which nutrients decrease DPP-IV activity. In a world of increasing obesity, satiety and food consumption is important in maintaining a moderate and healthy diet. Our study suggests that if you drink sweetened beverages with your meal, you may eat more.

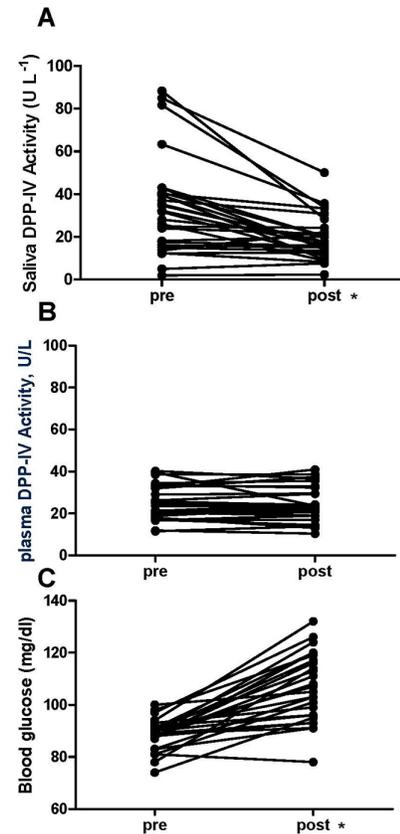


Figure 1: For all panels in the figure, each line represents an individual. (A) depicts a decrease in salivary DPP-IV activity was observed during the regular soda ingest condition. (B) depicts no change in plasma DPP-IV activity with the regular soda ingest condition. (C) depicts an increase in blood glucose in the regular soda ingest condition. * $p < 0.05$ different from pre.

Statement of Research Advisor:

This project was a group effort by my doctoral student, Leslie Neidert, and two undergraduate researchers, Caroline Hubbard and Elise Mann. Elise was involved with data collection for the entire project and also performed some of the data analysis.

- Dr. Heidi Kluess, Exercise Science