

Plasma Lipid, Glucose, and Immune Responses to Consumption of Nutritive and Nonnutritive Sweeteners and Exercise

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ABSTRACT

Although nonnutritive sweeteners are widely used as substitutes for nutritive sweeteners, it is currently uncertain how these commonly available sweeteners affect plasma glucose and lipid metabolism.

PURPOSE: To examine how nutritive and nonnutritive sweeteners influence plasma lipid profiles, complete blood counts, and plasma glucose content at rest and during exercise. **METHODS:** This randomized, double-blinded, cross-over design study included 9 healthy, college aged, individuals (4 females and 5 males). In four separate visits, participants consumed 8 oz of sweetened drink in random order with either 445mg of stevia, 507mg of aspartame, 169mg of sucralose, or 110,000mg of sucrose mixed into water. Each sweetened drink contained the equivalent to 3 sodas worth of sweetener. Participants had 2 minutes to consume each drink, then they rested in a chair for 30 minutes. At completion of 30 minutes of resting, participants completed a single bout of aerobic exercise on a cycle ergometer at 70% of HR_{max} for 45 minutes. Overnight fasting blood samples were collected at baseline, 30-min post-consumption of sweetened drink, and immediately post-exercise. **RESULTS:** At the 30-min post-consumption of the sweetened drink, plasma glucose level was significantly higher after consumption of sucrose (115.8 ± 6.14 mg/dL) than either sucralose (87.2 ± 7.09 mg/dL, $p=.032$) or stevia (86.1 ± 5.79 mg/dL, $p=.010$). However, the elevated plasma glucose level with sucrose was no longer significant immediately post-exercise. Following exercise, total cholesterol (TC), triglyceride (TG), and HDL-C were elevated (TC: 152.7 ± 9.66 to 158.6 ± 9.26 mg/dL, $p<.001$; TG: 69.5 ± 5.78 to 76.8 ± 5.83 mg/dL, $p=.002$; and HDL-C: 51.5 ± 2.47 to 53.9 ± 2.40 mg/dL, $p<.001$, respectively). Neutrophils increased (53.7 ± 2.67 to $59.1 \pm 1.93\%$, $p=.012$) and lymphocytes decreased (36.8 ± 2.56 to $31.3 \pm 1.56\%$, $p=.016$) from baseline to 30 minutes post-sweetener consumption. **CONCLUSIONS:** A rise in plasma glucose 30-min post-consumption of sucrose, which returned to baseline levels post-exercise, indicates that the plasma glucose may have been used as a substrate during exercise. Nonnutritive sweeteners, however, likely had no effect on substrate utilization throughout exercise, since there was no significant change in plasma glucose from baseline through exercise. The decrease in lymphocytes, along with a rise in neutrophils, while still in their respective normal range, may suggest an acute immune response to sweetener consumption.