Substrate utilization during exercise with glucose and glucose plus fructose ingestion in boys ages 10-14 yr

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We measured substrate utilization during exercise performed with water (W), exogenous glucose (G), and exogenous fructose plus glucose (FG) ingestion in boys age 10-14 yr. Subjects (n = 12) cycled for 90 min at 55% maximal O$_2$ uptake while ingesting either W (25 ml/kg), 6% G (1.5 g/kg), or 3% F plus 3% G (1.5 g/kg). Fat oxidation increased during exercise in all trials but was higher in the W (0.28 ± 0.023 g/min) than in the G (0.24 ± 0.023 g/min) and FG (0.25 ± 0.029 g/min) trials (P = 0.04). Conversely, total carbohydrate (CHO) oxidation decreased in all trials and was lower in the W (0.63 ± 0.05 g/min) than in the G (0.78 ± 0.051 g/min) and FG (0.74 ± 0.056 g/min) trials (P = 0.009). Exogenous CHO oxidation, as determined by expired CO$_2$, reached a maximum of 0.36 ± 0.032 and 0.31 ± 0.030 g/min at 90 min in G and FG, respectively (P = 0.04). Plasma insulin levels decrease during exercise in all trials but were twofold higher in G than in W and FG (P < 0.001). Plasma glucose levels decreased transiently after the onset of exercise in all trials and then returned to preexercise values in the W and FG (~4.5 mmol/l) trials but were elevated by ~1.0 mmol/l in the G trial (P < 0.001). Plasma lactate concentrations decreased after the onset of exercise in all trials but were lower by ~0.5 mmol/l in W than in G and FG (P = 0.02). Thus, in boys exercising at a moderate intensity, the oxidation rate of G plus F is slightly less than G alone, but both spare endogenous CHO and fat to a similar extent. In addition, compared with flavored W, the ingestion of G alone and of G plus F delays exhaustion at 90% peak power by ~25 and 40% respectively, after 90 min of moderate-intensity exercise.