Added Sugars Intake Explained by Amino Acid Carbon Isotope Ratio Profiles in a Controlled Feeding Study of U.S. Adults

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Objectives: To evaluate an amino acid carbon stable isotope ratio (CIR_{AA}) biomarker of added sugars (AS) intake in a controlled feeding study of men and women across age and BMI groups.

Methods: We conducted a 15-d feeding study in Phoenix, AZ, of men and women (N = 100, aged 18–70 y, BMI 17.9–35.0) who were recruited across sex, age, and BMI groups. Participants were provided personalized diets that resembled their habitual intakes, based on 2 consecutive 7-d food records. We measured CIR_{AA}s in serum samples (N = 99) collected at the end of the feeding period and determined correlations with dietary intakes. We used forward selection to construct a model to explain AS intake using participant characteristics and 14 measured CIR_{AA}s. This model was internally validated using a bootstrap optimism correction.

Results: Median (25^{th}, 75^{th} percentile) AS intake was 65.2 g/d (44.7, 81.4) and 9.5% (7.2%, 12.4%) of energy. The CIR of alanine had the highest, though still modest, correlation with AS intake (Pearson $r = 0.32$, $P = 0.001$). Serum CIR_{AA}s were more highly correlated with animal food intakes, especially the ratio of animal to total protein intake (APR). The highest correlations were between the APR and the CIRs of phenylalanine (Pearson $r = 0.85$, $P < 0.001$) and leucine (Pearson $r = 0.84$, $P < 0.001$). The model of AS intake included participant sex and body weight and the CIRs of 6 AAs: alanine, valine, lysine, glutamic acid, serine, and glycine. This model had modest explanatory power (multiple $R^2 = 0.38$), and the optimism-corrected R^2 for the model was lower ($R^2 = 0.15$).

Conclusions: The observed association between serum CIR_{AA}s and AS intake in the U.S. diet is encouraging; however, further investigation in populations with wider ranges of AS intake is warranted.

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