TACSM Abstract

Alpha-Cyclodextrin-Containing Beverages for Hydration Enhancement in Humans

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ABSTRACT

A substantial portion of the world's population may be inadequately hydrated, and dehydration is associated with several disease states and acute impairments in exercise performance. As such, there is continued interest in novel strategies to promote adequate hydration. The carbohydrate alpha-cyclodextrin has recently been shown to enhance water uptake through human aquaporins expressed in a single-cell model and promote longevity in model multicellular organisms. However, there is no relevant human research examining the potential hydrating effects of alpha-cyclodextrin-containing beverages. **PURPOSE**: To determine if novel beverage formulations containing alpha-cyclodextrin improve a bioimpedance-based hydration marker in humans. **METHODS**: In a randomized, double-blind, crossover design, eight adults (5 M, 3 F; [mean ± SD] age: 24.9 ± 4.2 years; height: 169.6 ± 5.5 cm; weight: 71.2 ± 13.2 kg; body mass index: 24.6 ± 3.2 kg/m^2; body fat: 17.0 ± 5.6%) completed trials including the ingestion of 1 liter of still water (control; CON), still water plus alpha-cyclodextrin (CD), or still water plus alpha-cyclodextrin and complexing agents (B-vitamins and amino acids; Complex). Before beverage ingestion, and every 15 minutes for two hours following beverage ingestion, bioimpedance spectroscopy was performed to estimate phase angle values as a noninvasive marker of cellular hydration. Phase angle was calculated as: $\arctan(Xc/R) \times (180°/\pi)$, where Xc is the reactance (indicative of the capacitive properties of the cell membrane) and R is resistance (opposition to flow of electrical current), both obtained from bioimpedance spectroscopy. Due to the pilot nature of this trial, data were analyzed using descriptive statistics only (data presented as median ± interquartile range). **RESULTS**: Two hours after completion of beverage ingestion, median ± interquartile range changes in phase in angle were 3.4 ± 1.7% for CON, 4.6 ± 1.2% for CD, and 5.4 ± 3.3% for Complex. Xc changes were 9.9 ± 2.9% for CON, 10.9 ± 3.0% for CD, and 11.1 ± 3.1% for Complex. R changes were 6.5 ± 1.4% for CON, 6.8 ± 1.9% for CD, and 5.6 ± 1.1% for Complex. **CONCLUSION**: The results of this pilot study indicate the potential for alpha-cyclodextrin-containing beverages to improve a bioimpedance-based hydration marker, phase angle, in humans, with the potential that B-vitamins and amino acids may further enhance hydration beyond alpha-cyclodextrin alone. The larger improvements in phase angle in the Complex group were due to a greater increase in bioelectrical reactance alongside a smaller increase in bioelectrical resistance. Future research with larger sample sizes should examine the potential for these beverages to improve human hydration and health.