Preventing dehydration in children with cystic fibrosis who exercise in the heat

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Purpose: In healthy children who exercise in the heat, the addition of flavor, carbohydrate and 18 mmol·L^-1 NaCl to water introduced a major increase in voluntary drink intake compared with the intake of unflavored water. This increase was sufficient to prevent voluntary dehydration. We hypothesized that, to achieve a similar effect in children with cystic fibrosis (CF), whose NaCl losses in sweat are markedly excessive, the drink should include an NaCl concentration higher than 18 mmol·L^-1. Methods: Eleven subjects with CF (6 girls, 5 boys, ages 10.9-19.5 yr) attended three 3-h sessions of intermittent exercise of moderate intensity (four 20-min bouts), at 35°C, 50% relative humidity. Either water (W), flavored water (FW), or a 30 mmol·L^-1 NaCl plus 6% carbohydrate solution (Na30) was offered ad libitum, in a counterbalanced sequence. Six subjects performed an additional session in which they drank a 50 mmol·L^-1 NaCl-6% CHO solution (Na50). Results: There was no significant drink effect on body fluid balance, core temperature, heart rate, or serum electrolytes with W, FW, or Na30. Serum osmolality decreased throughout the sessions from 290.6 ± 1.1 (mean ± SEM) to 281.3 ± 1.2 mmol·kg^-1 (P < 0.0005), serum sodium from 143.1 ± 0.5 to 141.1 ± 0.7 mmol·L^-1 (P = 0.01) and serum chloride from 109.1 ± 0.5 to 107.5 ± 0.5 mmol·L^-1 (P < 0.001). In contrast, the 50 mmol·L^-1 NaCl drink induced a near significant (P = 0.08) higher fluid intake, and it significantly ameliorated the rate of progressive dehydration. Conclusions: The marked loss of NaCl in the sweat of CF patients may induce an hypo-osmolar state in the serum, even when the drink contains 30 mmol·L^-1 NaCl. This may diminish the thirst drive triggered by hypothalamic osmoreceptors and may lead to voluntary dehydration. A flavored drink with an even higher salt content (50 mmol·L^-1), however, enhances drinking and attenuates the voluntary dehydration.