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Red blood cell fatty acid composition is detrimentally affected by changes from whole-fat to reduced-fat dairy products in children

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Circulating fatty acids (FAs) are affected by changes in dairy fat intake. However, there is limited evidence on how dairy fat affects erythrocyte membrane FAs in children. Hence, we aimed to investigate impacts on erythrocyte FAs from changes in dairy fat consumption in a double-blind randomized controlled trial of healthy 4–6-year-old children. The Milky Way Study enrolled 49 children (mean ± SD age: 5.2 ± 0.9 years; 47% girls). Whole-fat or reduced-fat dairy products in plain packaging were provided free to replace usual dairy intake for 3 months. Weighed 3-day food records and erythrocyte FAs were assessed pre- and post-intervention. Post-intervention FAs were correlated with mean 3-month dairy fat intake (weight of products supplied less weight returned) and final 3-day food record dairy fat consumption (in g/day and kJ%/day). We fitted linear mixed models, adjusted for growth, age and sex, to assess intervention interactions (dairy group x time changes) in erythrocyte FAs. We identified 18 erythrocyte saturated and unsaturated FAs (reported as a percent of the total). Saturated FAs (SFAs) myristic (C14:0) and pentadecanoic (C15:0) acid were positively correlated with child dairy fat intake: for 3-month intake, in g/day (C14:0: Kendall's $\tau = 0.29$; $p < 0.05$; C15:0: $\tau = 0.47$; $p < 0.01$) and in kJ%/day (C15:0: Pearson's $r = 0.53$; $p < 0.01$). Significant correlations with final 3-day dairy fat intake included heptadecanoic acid (C17:0): in g/day (C14:0: $\tau = 0.50$; $p < 0.01$; C15:0: $\tau = 0.54$; $p < 0.01$; C17:0: $\tau = 0.27$, $p < 0.05$) and in kJ%/day (C14:0: $\tau = 0.44$; $p < 0.01$; C15:0: $\tau = 0.60$; $p < 0.01$; C17:0: $\tau = 0.32$, $p < 0.05$). Adjusted mixed models showed significantly lower dairy group x time results in the reduced-fat compared with the whole-fat dairy group for SFAs C14:0 ($p = 0.043$) and C15:0 ($p < 0.001$), and for omega-3 polyunsaturated FAs (PUFAs) EPA ($p < 0.001$) and DPA ($p = 0.004$). Traditional cow's milk contains 1.38 mg/g milk fat of very long chain omega-3 PUFAs[(1)]: given an adjusted relative reduction in dairy fat intake of −12.9 ± 4.1 g/day (95% CI [−21.2, −4.6], $p = 0.003$) in the reduced-fat group, this corresponds to an intervention-related differential reduction of 18 mg/day of these omega-3 FAs (33% of the adequate intake of 55 mg/day EPA + DPA + DHA recommended for children aged 4–8 years). Dairy fat intake can significantly impact erythrocyte fatty acid composition in children. Erythrocyte pentadecanoic acid appears suitable as a biomarker of both longer-term and short-term dairy fat intake. Given that our study population maintained very low intakes of omega-3-rich fish and seafoods throughout, whole-fat dairy sources of omega-3 PUFAs are potentially useful to achieve dietary recommendations.

Reference

1. Średnicka-Tober D, Barański M, Seal CJ, *et al.* (2016) *Br J Nutr* **115** (6),1043–1060.