**Leg length, a marker of early childhood conditions, associates with specific clusters of serum fatty acids**

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**Background**: Adverse early childhood conditions have been associated with greater risk for adult chronic diseases such as type 2 diabetes (T2DM) and cardiovascular disease. However, the specific mechanism of action is not well elucidated. Adult leg length is a useful biomarker of early childhood conditions. We aimed to explore potential patterns within a broad spectrum of serum fatty acids (FA) based on associations with height and leg length.

**Methods**: Canadian adults (n=453) at risk for T2DM were recruited into a longitudinal cohort. The concentrations of 22 FA in the cholesteryl ester (CE), phospholipid (PL), triacylglycerol (TG), and non-esterified (NE) fractions were quantified at the baseline visit. Height and sitting height were measured, which were used to compute leg to height ratio (LHR). To identify clusters in the FA profile, partial least squares (PLS) was used with the stature components as the constraining variables and the FA as the predictor variables. Separate models were analyzed for height and LHR.

**Results**: We extracted the first two components (C1 and C2) for each PLS model (Figure). Higher LHR tended to have more of the C1 cluster (e.g. 20:5n-3 and 22:6n-3 in multiple lipid fractions) and less of the C2 cluster (e.g. 14:1n-7, 14:0, 16:0, 16:1n-7, 18:0 in primarily the TG and PL fractions). For height, there were no clusters of FA evident in C1, which may reflect that height correlates positively with more of all FA. Higher height tended to have more of the C2 cluster (e.g. 20 or more carbon long FA in multiple fractions).

**Discussion**: We found that shorter adult leg length had a distinct lipid profile compared to shorter height. This lipid cluster tended to reflect more omega-3 long chain FA and less of the 14 and 16 chain FA (which have been reported to associate with greater de novo lipogenesis). Our results suggest that early childhood conditions, as reflected in adult leg length, may lead to changes in lipid production and usage.

