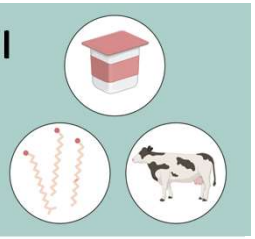
Plasma branched-chain fatty acids reflect dairy-fat intake in a pilot clinical trial in individuals with prediabetes

Victoria M. Taormina[1], Simonne Eisenhardt[1], Matthew P. Gilbert[2], Matthew E. Poynter[2], C. Lawrence Kien[2,3], Jana Kraft[1,2]

[1]Department of Animal and Veterinary Sciences, The University of Vermont, Burlington, VT 05405, USA; [2]Department of Medicine, The University of Vermont, Burlington, VT 05405, USA; [3]Department of Pediatrics, The University of Vermont, Burlington, VT 05405, USA.



Introduction

- Previous research identified the fatty acids (FAs) 15:0, 17:0, and/or 16:1 *t*9 as circulating biomarkers to represent dairy-fat intake; however, more research is needed to validate these FA biomarkers as accurate representations of dairy-fat intake.
- **Hypothesis:** The proportions of 15:0, 17:0, and 16:1 *t*9 in plasma total lipids will be greater following the consumption of 3 daily servings of full-fat yogurt compared to non-fat yogurt for 3 weeks, as will the proportion of other unique dairy-derived FAs (*e.g.*, *aiso*-15:0, *iso*-16:0, *aiso*-17:0, 18:1 *t*11, or 18:2 *c*9,*t*11).
- **Objective 1:** Compare the plasma FA profile of individuals with prediabetes following the consumption of a diet with full-fat (3.25%) yogurt (FFY diet) or non-fat yogurt (NFY diet) to evaluate the validity of currently utilized circulating biomarkers.
- **Objective 2:** Identify additional FAs that may serve as potential biomarkers of dairy fat intake.

Methods

- Randomized, double-masked, controlled crossover pilot study
- Total of 13 participants (6 men and 7 women), aged 45-75 years
- Controlled diet intervention (8 weeks total) comparing the consumption of an experimental diet with 3 daily servings of either non-fat yogurt (30% kcal from fat) or full-fat yogurt (38% kcal from fat) for 3 weeks each (Fig. 1)
- Fasting plasma samples were taken after each diet period and analyzed for FA composition of plasma total lipids using gas-liquid chromatography

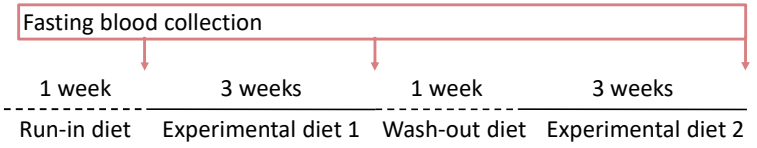


Figure 1. Overview of study design.

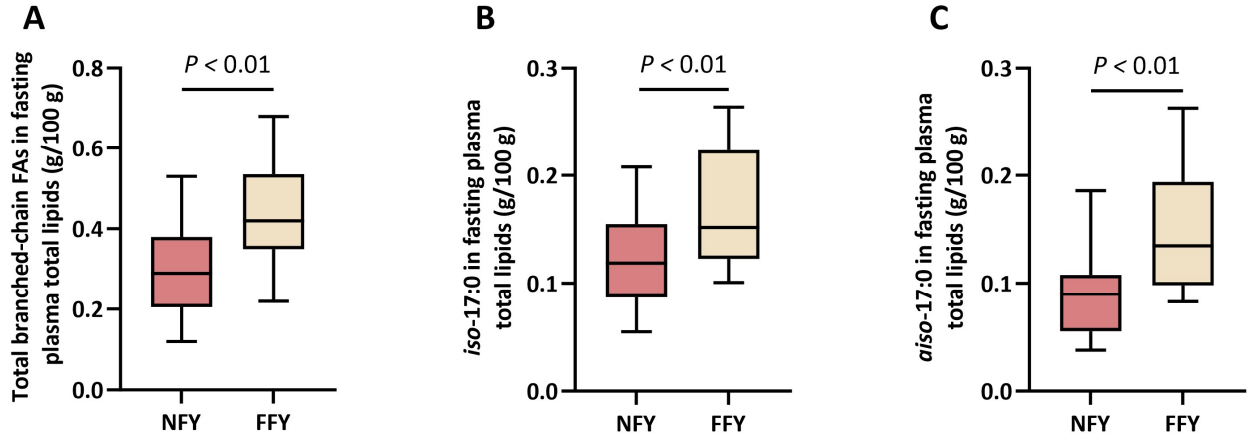


Figure 2. Diet-induced changes in proportions of total branched-chain FAs (A), *iso*-17:0 (B), and *aiso*-17:0 (C) in fasting plasma total lipids. Boxes represent interquartile range (25th to 75th percentile), whiskers indicate minimum and maximum values, and horizontal lines represent medians. FFY, full-fat yogurt diet. FAs, fatty acids. NFY, non-fat yogurt diet.

Results

- The proportion of total plasma branched-chain FAs, *iso*-17:0, and *aiso*-17:0 were greater in response to the FFY diet (Fig. 2), as were the proportions of *iso*-16:0 in fasting plasma ($P < 0.01$)
- No differences by diet were observed for the proportions of plasma total *trans*-FAs, total odd-chain FAs, 15:0, 17:0, 16:1 *t*9, 18:1 *t*11, *aiso*-15:0, *iso*-15:0, or 18:2 *c*9, *t*11 ($P > 0.01$)

Conclusion: Results from this pilot trial suggest that commonly utilized FA biomarkers may not be sufficiently robust to represent dairy-fat intake. Branched-chain FAs should be further explored for alternatives.

Victoria M Taormina, BS
Victoria.Taormina@uvm.edu
@V_Taormina

Funding provided by National Dairy Council, USDA National Institute of Food and Agriculture, and The University of Vermont's Food Systems Research Center

Created with BioRender.com and GraphPad Prism 9.4.1

The University of Vermont