

Plasma phospholipid fatty acid profiles confirm compliance to the dietary exchange of saturated with unsaturated fat in healthy men using full-fat or lower-fat dairy foods: results from the Reading, Imperial, Surrey, Saturated fat, Cholesterol Intervention (RISSCI) study

L. Sellem¹, R. Antoni², A. Koutsos¹, E. Ozen¹, G. Wong¹, H. Ayyad², B. Fielding², M.D. Robertson², K.G. Jackson¹, B.A. Griffin² and J.A. Lovegrove¹

¹Hugh Sinclair Unit of Human Nutrition, University of Reading, Whiteknights, Reading, UK and

²Department of Nutritional Sciences, Faculty of Health and Medical Sciences, University of Surrey, Guildford, UK

Dairy foods contribute to 21% of dietary saturated fatty acids (SFA) in British adults and may represent a key food group to help reduce dietary SFA to under 10% of total energy for the prevention of cardiovascular disease⁽¹⁾. The dietary exchange of SFA for monounsaturated (MUFA) and polyunsaturated fat (PUFA) was successfully implemented in 100 healthy men from the Reading, Imperial, Surrey, Saturated fat, Cholesterol Intervention (RISSCI) study. Participants broadly achieved the required nutritional targets while consuming two sequential 4-week isoenergetic diets with high (18% total energy) or low ($\leq 10\%$ total energy) SFA, with MUFA/PUFA replacing SFA in the latter⁽²⁾. The modulation of dietary SFA intake was primarily achieved by advising participants to purchase and consume either full-fat dairy foods (butter, high-fat cheese, and whole milk) in the high-SFA diet or reduced-fat dairy foods (fat-free yogurt, low-fat cheese, and skimmed milk) in the low-SFA diet. Snacks and vegetable spreads/oils rich in MUFA/PUFA were also provided to all participants for daily consumption. Thus, the current analysis aimed to evaluate the compliance to dietary advice using plasma phospholipid fatty acids profiles as a biomarker of dairy fat and/or high MUFA/PUFA consumptions.

Plasma samples collected at the end of each 4-week dietary intervention period were analysed using gas chromatography and flame ionisation detection to assess the relative concentrations of 27 fatty acids in phospholipids. Differences in fatty acid profiles of the intervention diets were assessed by orthogonal partial least square discriminant analysis (OPLS-DA). Goodness of fit and predictability of the model were assessed by the R²Y and Q² values, respectively, and permutation tests ($n = 1,000$ permutations) were used to assess the statistical significance of the model.

The OPLS-DA revealed a statistically significant discrimination of plasma phospholipid fatty acid profiles between the two diets with moderate goodness of fit ($R^2Y = 0.66$, $p_{\text{permutation}} < 0.001$) and predictive accuracy ($Q^2 = 0.57$, $p_{\text{permutation}} < 0.001$). Predictive loading values (p_{corr}) of individual fatty acids indicated that the observed separation was mostly driven by higher relative concentrations of C15:0 ($p_{\text{corr}} = 0.72$), C18:1 trans-11 ($p_{\text{corr}} = 0.69$), and C16:0 ($p_{\text{corr}} = 0.58$) in plasma phospholipids during the high-SFA diet, and of C20:1 cis-11 ($p_{\text{corr}} = -0.63$), C20:0 ($p_{\text{corr}} = -0.60$) and C22:0 ($p_{\text{corr}} = -0.48$) during the low-SFA, high-MUFA/PUFA diet.

These results indicate that higher relative concentrations of fatty acids typically found in dairy fat (C15:0 and C18:1 trans-11)⁽³⁾ were incorporated into plasma phospholipids when participants were advised to consume high-fat dairy foods as part of a high-SFA diet. Overall, these findings complement previous analyses from the RISSCI study to confirm the successful exchange of dietary SFA for MUFA/PUFA in healthy men^(2,4) and provide evidence to support the use of dairy foods as a key food group to achieve a reduction in dietary SFA at a population level.

References

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