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The effects of substitution of dietary saturated fatty acids with either monounsaturated fatty acids or n-6 polyunsaturated fatty acids on measures of endothelial function, arterial stiffness and blood pressure: results from the DIVAS study

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Endothelial dysfunction has been recognised as an early modifiable marker in the development of atherosclerosis and risk of cardiovascular disease (CVD)⁽¹⁾. A central public health strategy for the reduction of CVD includes the reduction in dietary saturated fatty acid (SFA) intake⁽²⁾. However, it remains unclear whether monounsaturated fatty acids (MUFA) or n-6 polyunsaturated fatty acids (n-6 PUFA) are the optimal fatty acids to replace dietary SFA. The aim of this study was to determine the effects of substitution of SFA with either MUFA or n-6 PUFA on measures of endothelial function, arterial stiffness and blood pressure in men and women at increased risk of developing CVD.

A total of 195 men and women at increased CVD risk (mean age 44 (SD 10) years and BMI 26.9 (SD 4.0) kg/m²) participated in a 16-week, parallel, randomised, controlled, single-blinded intervention study (DIVAS – (Dietary Intervention and Vascular function Study; ClinicalTrials.gov NCT01478958). Participants were randomly assigned (minimised for gender, age, BMI and CVD risk score) to one of the following isoenergetic diets: SFA-rich (target composition: 36% of total energy (%E) as total fat, 17%E SFA, 11%E MUFA, 4%E n-6 PUFA), MUFA-rich (36%E total fat, 9%E SFA, 19%E MUFA, 4%E n-6 PUFA), or n-6 PUFA-rich (36%E total fat, 9%E SFA, 13%E MUFA, 10%E n-6 PUFA). A flexible dietary model was developed to deliver the dietary interventions in which exchangeable fats in the habitual diet were replaced by study foods (spreads, oils, snacks) with a specific fatty acid composition. Flow-Mediated Dilatation (FMD) and Laser Doppler imaging (LDI) with iontophoresis were measured for assessing the endothelial function of the macro- and microcirculation, respectively. Pulse Wave Velocity/Analysis (PWV/PWA), Digital Volume Pulse (DVP) (measures of arterial stiffness) and 24-h Ambulatory Blood Pressure (24-h ABP) were also measured at baseline and following 16 weeks of intervention.

A significant deterioration in the FMD response, endothelium-dependent vasodilation of the microvascular circulation (LDI) and mean night SBP and DBP was observed following the SFA-rich diet relative to baseline ($P < 0.05$), but not following either n-6 PUFA or MUFA-rich diet. A significant diet interaction was observed for mean night SBP where replacement of SFA with MUFA attenuated the increase observed with SFA ($P < 0.05$).

In conclusion, this study showed that dietary SFA had a detrimental effect on vascular reactivity and blood pressure in a group at risk from CVD, which was not observed following the diets rich in unsaturated fatty acids. These data support current public health recommendations to reduce dietary SFA intake as a strategy for CVD risk reduction.

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1. Widlansky ME, Gokce N, Keaney JF Jr *et al.* (2003) *J Am Coll Cardiol* **42**, 1149–1160.
2. Astrup A, Dyerberg J, Elwood P *et al.* (2011) *Am J Clin Nutr* **93**, 684–688.