

EFFECT OF DIFFERENT TYPES OF DIETARY FAT ON HAEMOSTATIC FUNCTION
AND PLASMA AND AORTIC FATTY ACID COMPOSITION IN RATS

M.S. STEEL*, J.M. NAUGHTON*, G.W. HOPKINS*, K. O'DEA* and A.J. SINCLAIR**

In previous studies we have shown that increasing levels of butter in the diets of rats from 10% to 50% energy resulted in a significant, dose-dependent decrease in aortic prostacyclin (PGI_2) production and that this correlated closely with a decrease in the proportion of arachidonic acid (AA) and an increase in the proportion of eicosapentaenoic acid (EPA) in plasma and aortic phospholipids (PL). When lard was substituted for butter, there was no effect on any of the parameters measured (Young et al. 1985).

The aims of the present study were, firstly, to determine how other dietary fats affected prostanoid production and plasma and aortic PL FA composition, and, secondly, to determine whether supplementation with small amounts of pure AA could reverse the effects of butter-feeding. In the first series of experiments male Sprague Dawley rats were fed for two weeks on diets in which 10%, 30% or 50% of calories were derived from butter, olive oil, peanut oil or dripping. In the second series of experiments rats were fed the 50% butter diet for 4 weeks, the final two weeks of which they received a daily supplement of AA (0,5,10,20,40,80 $\mu\text{l}/\text{rat}/\text{day}$). At the conclusion of these dietary interventions aortic PGI_2 production and platelet function were measured as previously reported (Young et al. 1985). The FA composition of aortic and plasma PL was determined by capillary GLC (Sinclair et al. 1983).

Both butter and dripping at the 50% level significantly reduced PGI_2 production to half that in the 10% supplemented diets ($p < 0.01$, $p < 0.02$ respectively) and TXA_2 production in response to collagen was also reduced ($p < 0.001$). Consistent with their effects on prostanoid production, the butter and dripping diets resulted in significant changes in the FA composition of plasma and aortic PL: AA decreased and EPA increased, the effects being more pronounced in plasma than aorta. In contrast, neither olive oil nor peanut oil significantly affected any of these parameters. Supplementation of rats fed the 50% butter diet with 80 μl AA/ rat/day completely reversed all of the effects of butter feeding, with a small but significant effect already evident with only 10 μl AA/ rat/day . These changes in prostanoid production were closely paralleled by changes in FA composition of plasma and aortic PL: with the proportion of AA increasing and that of EPA decreasing as the AA supplement increased.

The results of this study show that only the most saturated fats, butter and dripping (with P/S ratios of 0.05 and 0.06 respectively in the 50% diets) had significant effects on the parameters measured. Lard, olive oil and peanut oil, with P/S ratios of 0.19, 0.60 and 1.5 respectively had no effect. However, the mechanism by which dietary saturated fat acts appears to be more complex than simply through low P/S ratio, since supplementation of 50% butter-fed rats with very low doses of AA reversed the effects on all parameters without significantly increasing the P/S ratio. These results suggest that quite small intakes of preformed AA are able to counteract the effects of high intakes of saturated fat on prostanoid production.

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* Department of Medicine, Royal Melbourne Hospital, Victoria 3050

** Department of Applied Biology RMIT, Melbourne, Victoria 3000