EFFECT OF DIETARY LIPIDS ON THE PLASMA MEMBRANE LIPID COMPOSITION OF ISOLATED HUMAN CHEEK CELLS

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It is now widely recognised that the nature of the dietary lipid intake can modify cell function by influencing cell membrane lipid composition and membrane physical properties (McMurchie 1988). To begin investigating these effects, we chose to use human cheek epithelial cells which exhibit a range of metabolic and membrane-associated functions, including ion-transport activity (McMurchie et al. 1993). The aim of this study was to investigate the effect of dietary lipid intake on two qualitative indices of membrane lipid fluidity in the cheek cell, namely the cholesterol-to-phospholipid (C/PL) and sphingomyelin-to-phosphatidylcholine (SM/PC) ratios. Both C/PL and SM/PC ratios are inversely related to membrane lipid fluidity. Cheek cell samples were collected from 26 healthy adult subjects who were participating in a randomised, double-blind, crossover dietary lipid intervention trial. Subjects consumed a low-fat, low-cholesterol baseline diet, followed by two three-week intervention periods, during which they were either assigned a high-fat to low-fat (HF→LF) or low-fat to high-fat (LF→HF) dietary protocol. Blood and cheek cell samples were collected after the baseline and intervention periods, enabling direct comparisons to be made between blood lipid levels (total plasma cholesterol, LDL, HDL and triglyceride) and the cheek cell plasma membrane lipid parameters described above. There was considerable variation in the individual response to the dietary lipid interventions. Overall, in the HF→LF group (n=13), cheek cell C/PL values decreased by 16% after the first intervention period, compared to the baseline diet. After the second intervention period, the SM/PC ratio decreased by 23% in this dietary group. In the group assigned the LF→HF dietary protocol, both ratios increased after the first intervention period and the SM/PC ratio decreased after the second period. Cheek cell C/PL was positively correlated with plasma LDL ($r=0.68$, $P=0.02$) in the HF→LF group, after the first intervention period. Whilst the cheek cell plasma membrane lipid composition appears to be variable among individuals, the nature of the dietary lipid intake does in part influence the cheek cell membrane lipid profile. As such, there is potential to use this tissue as a marker for membrane lipid changes in human dietary studies.

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