GCIRCBUL09*37

# Non-Fatty Acid Components of Oils Rich in Monounsaturated Fat

Tatu A. MIETTINEN

Second Department of Medicine, University of Helsinki, SF-00290 Helsinki, Finland

Monoene triglycerides significantly lower serum cholesterol level in man. Rapeseed oil and olive oil are rich in monoene triglycerides. Olive oil is widely used in the Mediterranean area, while consumption of rapeseed oil is increasing in Scandinavia. However, contribution of non-fatty acid derivatives especially plant sterols (mainly campesterol and sitosterol) and squalene to cholesterol lowering is poorly known. Olive and rapeseed oils differ markedly from each other as far as their plant sterols and squalene contents are concerned. The two oils appear to contain also antioxidants. Olive oil is rich in squalene and contains relatively little plant sterols, while rapeseed oil contains only traces of squalene but the plant sterol content can increase up to 1 g/100 g of oil. The squalene content of olive oil is variable 150–900 mg/100 g of oil and that of plant sterols only about 100 mg/100 g of oil. We have been interested in contribution of dietary squalene and plant sterols to serum cholesterol responses in man. Olive oil feeding (35% of calories) reduced serum cholesterol level during unaltered cholesterol intake but increased the squalene and other cholesterol precursor/cholesterol ratios (especially those of esterified methyl sterols) in serum, suggesting that increased squalene intake enhanced cholesterol synthesis. Serum plant sterols, especially campesterol, the amount of which is very low in olive oil, tended to decrease. A short term feeding of squalene, added to a normal diet, caused almost similar changes except that serum cholesterol tended to increase. The increase in cholesterol precursors, in addition to squalene, was highest in esterified methyl sterols and was less consistent in demethylated precursor sterols. Fecal steroid analysis indicated about 50% absorption of squalene but showed only a small increase in bile acids and cholesterol synthesis. The relative increase in the serum precursor sterols was in fact higher than that in cholesterol synthesis measured by the sterol balance technique. Another study, a nine-week large dose (1.1 g/day) squalene feeding in dietary rapeseed oil, showed significantly increased serum total, VLDL, IDL and LDL cholesterol, while an additional four-week period on a 0.5 g/day of squalene feeding normalized the values. The increase in LDL cholesterol was associated with a proportional decrease in fractional removal and enhanced transport of LDL apo B, suggesting downregulatation of apo B receptor activity probably due to an increased squalene-derived cholesterol synthesis.

A replacement of dietary fat by rapeseed oil decreased serum total, VLDL and LDL cholesterol, and cholestanol, and increased HDL cholesterol, cholesterol precursor sterols and plant sterols. The changes in serum cholesterol were most likely caused mainly by increased dietary monoenes, contributed perhaps by lowered dietary cholesterol, but a possibility is not excluded that the decrease in cholestanol and the increase in precursor sterols were related to inhibition of intestinal sterol, including cholesterol, absorption by rapeseed oil plant sterols. Other plant sterol feeding studies actually showed that cholesterol absorption efficiency was decreased and that the decrease in cholesterol absorption efficiency was significantly related to the decrease in serum values of other plant sterols. It can be concluded from these findings that at least squalene and plant sterols from among non-fatty acid components of olive oil and rapeseed oil contribute to serum lipid levels during dietary intake of these vegetable oil.