Abstract

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Differential effects of eicosapentaenoic acid and docosahexaenoic acid on human skin fibroblasts.

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OBJECTIVE AND METHODS: To better understand the mode of action of omega 3 fatty acids in cell membranes, human foreskin fibroblasts were grown in serum-free medium supplemented with 50 microM oleic acid linoleic acid, eicosapentaenoic acid (EPA) or docosahexaenoic acid (DHA), and the effects on membrane composition, fluorescence polarization and enzyme activities were followed.

RESULTS: The cells were enriched with EPA and DHA up to 7 and 13% of total lipids, respectively, of which > 95% was associated with phospholipids. In addition, the concentration of 22:5n-3 increased with both EPA and DHA to 7.5, and 2.1% of the total fatty acids, respectively. When compared to controls (oleic acid), cells treated with DHA showed a decrease in cholesterol, phospholipids, arachidonic acid (AA) and free cholesterol/phospholipid ratio ($P < 0.05$). In the presence of EPA, only decreases in AA and cholesterol were significant ($P < 0.05$). Membrane fluidity, assessed by fluorescence anisotropy, was increased 16% in cells enriched with DHA ($P < 0.05$), but showed no change with EPA or linoleic acid. There was an increase in membrane-associated 5'-nucleotidase (+27%) and adenylate cyclase (+19%) activities ($P < 0.05$), in DHA-enriched, but not in EPA-enriched cells, when compared with oleate controls.

CONCLUSIONS: The studies show that incorporation of DHA, but not EPA, into cell membranes of fibroblasts alters membrane biophysical characteristics and function. We suggest that these two major n-3 fatty acids of fish oils have differential effects on cell membranes, and this may be related to the known differences in their physiological effects.

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