DETERMINATION OF THE DEGREE OF LIPID OXIDATION BY GAS CHROMATOGRAPHY

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INTRODUCTION

Fish oils, in general, consist predominantly of triglycerides and phospholipids, and minor proportions of free fatty acids, vitamins, etc.

Fish oils contain approximately 15 - 40% (on the weight of total fatty acids) of saturated fatty acids. The main saturated fatty acid is palmitic acid $C_{16}H_{32}O_2$.

Polyenoic acids of the C_{16-24} series occurs in fish oils. The acids of the C_{20} and C_{22} series are the most abundant. An eicosapentaenoic acid, $C_{20:5}$, and a decosahexaenoic acid, $C_{22:6}$ occurs as a major component in most marine oils. It has been suggested that in the docosahexaenoic acid the double bonds are either in the 4-5, 8-9, 12-13, 15-16, 18-19 and 21-22 or the 4-5, 8-9, 11-12, 14-15, 17-18 and 20-21 position.

Since both palmitic acid and docosahexaenoic acid are abundant in fish oils, we can use them to measure the degree of lipid oxidation that has occured during frozen storage.

PROCEDURE

Sample Preparation

The sample is prepared by the boron trifluoride method.

Analytical Procedure

The procedure is the same as that for the determination of methyl esters of fatty acids by gas chromatography.

CALCULATION

The index of oxidation, I, is defined as:

$$I = 1 - \frac{\frac{x'}{y'}}{\frac{x}{y}}$$

where x' = % of $C_{22:6}$ of stored sample

y' = % of $C_{16:0}$ of stored sample

x = % of $C_{22:6}$ of fresh sample

y = % of $C_{16:0}$ of fresh sample.

Hence, by measuring the ratio of $C_{22:6}$ and $C_{16:0}$ at the initial and subsequent stages, we can use the index of oxidation as a measure of the degree of docosahexaenoic acid.

REFERENCE

By personal communication with Mr Kinumaki (1983).