

Flaxseed Oil: Acute and Chronic Supplementation Increases Serum and Tissue Concentrations of Omega Fatty Acids in Rats

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Abstract

Linoleic acid (ω -6 family) and α -Linolenic acid (ω -3 family) are two polyunsaturated fatty acids (PUFAs) that are known as essential fatty acids and must be provided by diet. They play an important role in disease prevention (and visual and neural development). Their use leads to a reduction in mortality for myocardial infarction, sudden cardiac death (Albert et al. 2002) and thrombotic or ischemic stroke (Ascherio et al. 1996). Randomized controlled trials have found that fish oil supplementation significantly lowers serum triglyceride levels in diabetic individuals and has an antiinflammatory effect against rheumatoid arthritis (Kremer, 2000), ulcerative colitis (Aslan, 1992) and Crohn's disease. Finally, several small studies have found that omega-3 fatty acid are lower in the plasma and fat of individuals suffering from depression compared to controls. Furthermore it must be stressed that patients who took EPA and DHA supplements (PUFA come from linolenic acid) experienced less depression than those who were treated with the placebo (Stoll et al. 1999).

In the first part of our work we studied the bioavailability of acute supplementation of flaxseed oil (Organic Oils–Perugia) by analysing the level of ALA (ω -3) and linoleic acid (ω -6) in serum and tissues (adipose, liver and brain) of rats tested at 2-4-8-16 h after the administration. The amount of flaxseed oil administered orally was 1.9, 4.7, 9.5 mL/kg corresponding to 1, 2.5, 5 g ALA/kg. The corresponding fatty acid methyl esters obtained with direct methylation with MeOH/HCl, were quantified by gas chromatography/mass spectrometry (GC/MS) technique.

Serum ALA levels increased by 70% in the flaxseed oil treated group (1.9 mL/kg) after 2h in comparison with controls. Whereas no further increase was found in animals treated with the higher doses (4.7 and 9.5 mL/kg). Furthermore ALA was significantly increased after 4 h in adipose tissue and in liver of rats dosed at 1.9 mL/kg of flaxseed oil. Also in this case there was no advantage by increasing the doses. Concerning linoleic acid (ω -6) no significant increased concentrations were found in serum at the three doses studied confirming that flaxseed oil is mainly a source of ω -3 fatty acids. These data suggested that there is a limiting step in the adsorption of these fatty acids and that there is no advantage to take more than 1 g/kg of ALA supplementation.

Secondly we studied the bioavailability of a chronic supplementation of the flaxseed oil by analysing the level of ALA (ω -3) and linoleic acid (ω -6) in rat plasma with an HPLC analysis.

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