

# Enrichment of Long Chain *n*-3 PUFA in different Blood Fractions under Supplementation with an Alpha-linolenic Acid-rich Vegetable Oil

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**Introduction:** Overfishing, world population growth, fish intolerance and vegetarianism are the difficulties which are related to an adequate intake of marine *n*-3 long chain (LC) PUFA such as EPA and DHA. Thus, it is necessary to identify a potential plant derived *n*-3 PUFA source in human nutrition to improve the supply.

**Aim:** The objective of the intervention study was to investigate the effect of an ALA-rich linseed oil on the fatty acid distribution in different blood fractions (plasma, red blood cells [RBC], peripheral mononuclear cells [PBMC]), with focus on the enrichment of *n*-3 LC PUFA. In addition, the accumulation of *n*-3 LC PUFA is compared between various populations of different age, gender and physiological conditions (metabolic syndrome).

**Design:** 61 participants were allocated into three intervention groups (group 1: 26 years [y] & BMI 22; group 2: 59 y & BMI 23; group 3: 62 y & BMI 30). Each group achieved 17 g of an ALA-rich vegetable oil per day over a period of eight weeks (4.6 g ALA/day). The control group (n=16) received 17 g *n*-3 PUFA-free olive oil. All subjects consumed no *n*-3 PUFA-rich foods, e. g., sea fish and *n*-3-rich oils (10 wks).

**Results:** All subjects showed higher portions of ALA and SDA in plasma, RBC and PBMC. The *n*-3 LC PUFA ETA, EPA (1.2- to 1.7-fold) and DPA (1.1- to 1.4-fold) increased in all blood fractions during the eight weeks of intervention. With regard to ALA, SDA, ETA and EPA, the highest increase was recorded in the first week. However, the DHA decreased in all blood fractions during the intervention.

In serum the total cholesterol, LDL-cholesterol and triacylglycerol concentration remained unaffected in the intervention group 2 and 3. During the linseed oil supplementation in normocholesterolemic male subjects (group 1) the total cholesterol as well as LDL-cholesterol decreased. The HDL-cholesterol increased in all subjects except in the female normocholesterolemic subjects.

**Conclusion:** The daily consumption of 17 g ALA-rich linseed oil is suitable to improve the *n*-3 LC PUFA status in humans and decreases the *n*-6/*n*-3 ratio in tissues. Furthermore, the HDL-cholesterol as a protective factor against coronary heart diseases increased during the linseed oil intervention.

ALA, alpha-linolenic acid; DPA, docosapentaenoic acid; DHA, docosahexaenoic acid; EPA, eicosapentaenoic acid; ETA, eicosatetraenoic acid; SDA, stearidonic acid.