

Omega-3 Supplementation, Menstrual Cycle, and Acute Eccentric Exercise on Plasma Lipid Profiles

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ABSTRACT

Omega-3 fatty acids supplementation and the menstrual cycle may independently influence plasma lipids and lipoproteins following acute exercise. **PURPOSE:** The current study investigated the effects of dietary fish oil supplement and acute eccentric exercise on plasma lipids and lipoproteins during two different phases of the menstrual cycle [mid-follicular (MF) vs. mid-luteal phase (ML)]. **METHODS:** As a double-blind, placebo-controlled design, 22 healthy young females (age = 20.86 ± 1.39 years) volunteered. Participants were randomly assigned to either the fish oil (N=11) or the placebo (N=11) group. The fish oil group took a total of 6 capsules of fish oil per day (6g total; each capsule with 2.4 g of eicosapentaenoic acid and 1.8 g of docosahexaenoic acid), while the placebo group took 6 capsules of safflower oil/day (6g total; 2.8 g of lauric acid, 1.1g of myristic acid, 0.4 g of caprylic acid, 0.4 g of oleic acid, and 0.09 mg of linoleic acid) for 3 weeks. Participants in each group performed an acute eccentric single-leg exercise protocol during the MF and ML phases, which consisted of 10 sets of 10 repetitions with a 3-min resting between sets at an isokinetic speed of $30^{\circ}/\text{sec}$. The leg exercised for the MF phase was randomly selected and the opposing leg exercised during the ML phase. Plasma samples were collected at pre-, 6-hours post-exercise (6-hr PE), and 24-hours post-exercise (24-hr PE) to analyze total cholesterol (TC), high-density lipoprotein (HDL-C), lipoprotein (a), very low-density lipoprotein (VLDL-C), and low-density lipoprotein (LDL-C). Data were analyzed using a multivariate analysis of variance ($p < 0.05$). If a significant interaction was found, a Tukey's post-hoc test was performed. **RESULTS:** Plasma lipids and lipoproteins were not different between the fish oil and placebo groups or before and after the acute eccentric leg exercise. However, HDL-C was significantly higher ($p = 0.041$) during the ML (61.66 ± 2.44 mg/dL) phase than that of the MF (54.53 ± 2.44 mg/dL) phase. **CONCLUSION:** Although it didn't reach a statistical significance, the overall lipid and lipoprotein profile tended to improve following a relatively short-term fish oil supplement in healthy, young women. Acute eccentric exercise may not negatively affect plasma lipids and lipoproteins. Elevated HDL-C during the mid-luteal phase may possibly be associated with increased estradiol levels. It is recommended for future studies that an extended period of fish oil supplement using different dosages and exercise regimen be implemented to examine a long-term benefit of fish oil supplement in a variety of sample groups.