Atlantic salmon (*Salmo salar* L.) as a Net Producer of Long Chain Marine Omega-3 Fatty Acids

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Aquaculture is one of the fastest growing food producing sectors, but concerns are related to the fish oil demand needed in the production of fish feed. The replacement of fish oil with vegetable oil decreases the concentration of the health beneficial long chain marine polyunsaturated fatty acids of the omega-3 series (*n*-3 LC-PUFA) in the feed and in the fish fillet. The objective of this study was to address the issue of net-production of *n*-3 LC-PUFA in salmon fed three different replacement diets for 12 months; 80PP35VO (80% of fishmeal FM replaced by plant protein PP and 35% of fish oil FO replaced by a vegetable oil VO blend), 40PP70VO (40% of FM replaced by PP and 70% of FO replaced by a VO blend), 80PP70VO (80% of FM replaced by PP and 70% of FO replaced by a VO blend) and one control diet, FMFO. Fatty acid productive value (FAPV) of ingested fatty acids, total β-oxidation capacity of red- and white muscle and liver, and fatty acid composition of fillet and whole fish was investigated. The fatty acids of the fillet and whole fish were significantly modified by the replacement diets compared to the control diet. In the first experimental period fish fed the maximum replacement diet (80PP70VO) gained 2.7 g DHA by eating 1.9 g DHA resulting in a net-production of 800 mg DHA and a FAPV of more than 140%. Fish fed the FMFO diet gained 7.5 g DHA by eating 9.4 g DHA resulting in a net loss of 1900 mg DHA and a FAPV below 100%. All in all, this feeding trial show that Atlantic salmon can be a net-producer of the health promoting *n*-3 LC-PUFA when up to 70% of the fish oil is replaced by vegetable oils. It is concluded that the use of vegetable oils in feed to Atlantic salmon could be a strategy to increase the endogenous production of *n*-3 LC-PUFA and increase the available marine *n*-3 HUFA pool.