Muscle Lipid Storage Pattern, Adipocyte Distribution and Expression of Lipid Metabolism Genes in Atlantic Salmon (*Salmo salar* L.) fed Fish Oil and Plant Oil .

Bente E. Torstensen[a], Dominic A. Nanton[ad], Anne Vegusdal[b], Ingunn Stubhaug[a], Hilde Sundvold[c], Anna Maria Bencze Rørå[b], Grete Baeverfjord[b], Bente Ruyter[b]

[a]National Institute of Nutrition and Seafood Research (NIFES), Bergen, Norway, [b]AKVAFORSK, Ås and Sunndalsøra, Norway, [c] Department of Animal and Aquaculture Science, University of Life Science, Ås, Norway, [d]Current address: EWOS Innovation, Dirdal, Norway

The effects of dietary oil source on lipid storage and expression of genes involved fatty acid uptake, intracellular transport and fatty acid catabolism were evaluated in harvest size Atlantic salmon fed fish (FO) or plant oil (PO) based diets from start-feeding. Final weight and fat content was not significantly different for salmon fed FO and PO diets over a 27 month period. No obvious differences were observed histologically in the lipid storage patterns of the tissues analysed for salmon fed FO and PO diets. Intracellular lipid droplets were observed by light microscopy in oil red O stained frozen sections of the red muscle but not observed to any extent in the white muscle (dorsal, lateral and ventral) for salmon fed FO and PO diets. Observations at higher magnifications, however, revealed small lipid droplets located in close association with mitochondria in the cytoplasm of white muscle cells. High densities of adipocytes were observed in the myosepta of red and white muscle for salmon fed FO and PO diets. White muscle myosepta had a significantly higher total lipid content and proportion of TAG than the white muscle. Normalised expression of fatty acid binding protein 3 (FABP3) , FABP4, FABP10, fatty acid transport protein (FATP), cd36, carnitin palmitoyl transferase II (CPTII), peroxisome proliferating activating receptor β (PPARβ), acyl-CoA oxidase (AOX), long chain fatty acyl-CoA synthetase (FACS), acyl-CoA dehydrogenase (Dehydrogenase) and uncoupling protein II (UCPII) was measured in the lipid storing and metabolic tissues. In white muscle tissue expression of FABP4 and FABP3 and fatty acid oxidation related genes were down regulated in plant oil fed fish. This correlated with lower white muscle and myosepta lipid level, however not significant due to high variation in TAG-levels between samples. Further, visceral fat FABP4 and FABP3 was more than 2-fold down regulated in plant oil fed salmon.

Acknowledgement

This experiment was funded as a part of the Norwegian Research Council project, Strategic Institute Program, 158930/I10 entitled "Establishing knowledge within functional genomics and biochemistry for optimal use of future fish feed lipid resources" and the feeding experiment was part of the project "Researching Alternatives to Fish Oils in Aquaculture" (RAFOA), Q5RS-2000-30058 funded by the EU Fifth Framework Programme.