# Identification and characterization of myomaker expression in rainbow trout (Oncorhynchus mykiss)

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## Identification and characterization of myomaker expression in rainbow trout (*Oncorhynchus mykiss*)

Aurélie Landemaine, Pierre-Yves Rescan, Jean-Charles Gabillard.

INRA, UR1037 Fish Physiology and Genomics, F-35000 Rennes, France
Aurelie.landemaine@rennes.inra.fr

Myocytes fusion is a fundamental process for skeletal muscle formation during development, post embryonic muscle growth and regeneration in most animals. Our knowledge regarding molecular mechanisms controlling this essential step in myogenesis is far from being complete. A critical step in fusion is the initial recognition and adhesion between two myogenic cells before they fuse. Among the factors involved in these processes, Myomaker (also called Tmem8c), a new membrane activator of myocytes fusion and muscle formation, was recently discovered in mice. We wondered whether an orthologous gene was present in teleosts. In rainbow trout genome, we found one copy of this gene coding for a protein of 221 amino acids. Sequences alignment shows that rainbow trout myomaker has a high sequence identity (70%) with mice. Using whole mount *in situ* hybridization on rainbow trout embryos at different stage of embryonic development, we observed that myomaker is transiently expressed during somitogenesis exclusively in somite muscle differentiating cells of the fast-twitch lineage. In agreement with these results, *in vitro* analysis on trout satellite cells showed that the expression of myomaker increases during differentiation. Further, qPCR analysis on juvenile trout showed that the expression of myomaker is muscle-specific. *In vivo* analysis, based in a starved/refeeding experiment on juvenile trout showed an increase of myomaker expression during muscle recovery suggesting muscle cells fusion. These findings reveal a high degree of evolutionary conservation in the expression of myomaker during myogenesis between teleosts and mammals. *In vitro* experiments are in progress to study the hormonal regulation of myomaker on trout satellite cells.

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## Characterizing appetite controlling system in fast-growing Atlantic cod larvae

Rønnestad, I.[1*], Angotzi, RA.[1], Le, HTMD.[1,2], Edvardsen, RB.[3], Ebbesson, L.[4], Arukwe, A.[5], Karlsen, Ø.[6], van der Meeren, T.[6], Jensen, KH.[1], Jordal, A-E.O.[1]

[1]Dept. Biology, University of Bergen, Bergen, Norway; [4]UniResearch, Bergen, Norway; [2]Nha Trang University, Nha Trang, Vietnam; [3]Inst. of Marine Research, Bergen, Norway; [5]NTNU, Trondheim, Norway; [6]Inst. of Marine Research, Austevoll, Norway.
(*ivar.ronnestad@bio.uib.no)

The current production of Atlantic cod depends on enriched rotifers and Artemia during first feeding but development and growth are still inferior to fish fed natural zooplankton. The underlying mechanisms for this phenomenon are not well understood. In this study we aimed to describe the ontogeny and dietary effects on systems controlling appetite in Atlantic cod. We used two groups of larvae, one that was fed natural zooplankton (mostly copepods; reference group), and one that was fed enriched rotifers and later *Artemia*.

In Situ Hybridization analysis on the reference material showed spatial and temporal changes in expression patterns of important hormone genes during ontogeny. All analysed genes involved in appetite control were detected in the brain from first feeding. Strong ISH signals of NPY in telencephalon may indicate that this area besides the hypothalamus may be involved in stimulation of appetite in cod. Beside, strong expression of CART in thalamus, hypothalamus and medulla oblongata suggests "satiety centres" may be located in these areas. POX was found in preoptic region and in the hypothalamus. Interestingly, we found co-location of orexigenic (POX) and anorexigenic (CART) signals in preoptic regions, hypothalamus and medulla oblongata suggesting that these areas may act as integration centres for modulation of appetite in developing cod larvae.

Next, we examined gene expression (RNA sequences, transcriptome) of two defined growth stages (2 and 3), corresponding to 22 and 32 days after hatching, when the differences in growth were largest with daily length growth of larvae fed copepods twice as high as larvae fed rotifers and *Artemia*. 34 of 64 genes described to be involved in mammalian anorexigenic pathways were down-regulated in larvae fed copepods. PYY, CART, but not MSHs were down-regulated in copepod fed fish while AgRP, NPY, and orexin were up regulated in the same group.

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