Muscle growth and remodeling in trout: insights from transcriptomics

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S4.O2. MUSCLE GROWTH AND REMODELING IN TROUT: INSIGHTS FROM TRANSCRIPTOMICS.

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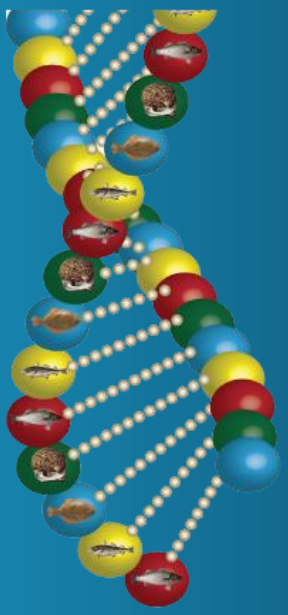
SUMMARY

Fish skeletal muscle growth combines hyperplasia (generation of new muscle fibres) and hypertrophy (increase in muscle fibre size) far into adulthood. To know more about the genes regulating hyperplasia and hypertrophy and their relative contribution to muscle regeneration and to the compensatory muscle growth response, we examined gene expression profiling in (i) laser-captured superficial hyperplastic growth zones of pre-hatched larvae myotome (ii) regenerating adult muscle after mechanical crushing and (iii) adult muscle during compensatory growth induced by a fasting-refeeding sequence. Using Agilent microarray platform we found that the major biological functions associated with genes up-regulated in hyperplastic growth zones of pre-hatched larvae were related to cell cycle, myogenesis, RNA processing and protein synthesis. Specifically, hyperplasia-correlated genes included genes encoding transcriptional regulators (such as homeobox-containing regulators and Myc paralogs along with canonical bHLH myogenic regulatory factors), epigenetic factors (such as members of the PRMT and SWI/SNF families), secreted signaling molecules and membrane associated proteins potentially involved in cell fusion (including Kin of IRRE like3 and jam2b). Most of the genes up-regulated in hyperplastic growth zones of pre-hatched larvae were overexpressed in regenerating muscle of aged trout, notably those known or predicted to be important for differentiation of myogenic cells or their fusion into new myofibres. In contrast, the gene signature associated with the burst of growth that follows refeeding in fasted trout showed high enrichment in GO terms promoting myofibre hypertrophy (i.e. RNA processing, ribosome biogenesis, translation and protein folding) but not myofibre formation. Taken together these data show that distinct genetic pathways, regulating hyperplasia or hypertrophy, may be activated to drive distinct aspects of the growth and remodeling of fish muscle.



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