

Conserved structure and expression of hsp70 paralogs in teleost fishes - DTU Orbit (08/11/2017)

Conserved structure and expression of hsp70 paralogs in teleost fishes

The cytosolic 70 KDa heat shock proteins (Hsp70s) are widely used as biomarkers of environmental stress in ecological and toxicological studies in fish. Here we analyze teleost genome sequences to show that two genes encoding inducible hsp70s (hsp70-1 and hsp70-2) are likely present in all teleost fish. Phylogenetic and synteny analyses indicate that hsp70-1 and hsp70-2 are distinct paralogs that originated prior to the diversification of the teleosts. The promoters of both genes contain a TATA box and conserved heat shock elements (HSEs), but unlike mammalian HSP70s, both genes contain an intron in the 5' UTR. The hsp70-2 gene has undergone tandem duplication in several species. In addition, many other teleost genome assemblies have multiple copies of hsp70-2 present on separate, small, genomic scaffolds. To verify that these represent poorly assembled tandem duplicates, we cloned the genomic region surrounding hsp70-2 in *Fundulus heteroclitus* and showed that the hsp70-2 gene copies that are on separate scaffolds in the genome assembly are arranged as tandem duplicates. Real-time quantitative PCR of *F. heteroclitus* genomic DNA indicates that four copies of the hsp70-2 gene are likely present in the *F. heteroclitus* genome. Comparison of expression patterns in *F. heteroclitus* and *Gasterosteus aculeatus* demonstrates that hsp70-2 has a higher fold increase than hsp70-1 following heat shock in gill but not in muscle tissue, revealing a conserved difference in expression patterns between isoforms and tissues. These data indicate that ecological and toxicological studies using hsp70 as a biomarker in teleosts should take this complexity into account

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