Conserved gene expression reveals our 'inner fish'

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A study of gene expression in chickens, frogs, pufferfish, mice and people has revealed surprising similarities in several key tissues. Researchers writing in BioMed Central's open access *Journal of Biology* have shown that expression in tissues with a limited number of specialized cell types is strongly conserved, even between the mammalian and non-mammalian vertebrates.

Timothy Hughes from the University of Toronto, Canada, worked with a team of researchers to investigate evolutionary alterations in gene regulation in the five different vertebrates. They found that although the specialized DNA sequences that regulate the expression of the genes seem to have changed beyond recognition over the hundreds of millions of years since the clades parted evolutionary company, the actual patterns of gene expression remain closely conserved. According to Hughes, "There are clearly strong evolutionary constraints on tissue-specific gene expression. Many genes show conserved human/fish expression despite having almost no nonexonic conserved primary sequence".

The authors studied 3074 genes that were present as a single unambiguous copy in each of the five genomes. The similar expression profiles they uncovered suggest the existence of a basic ancestral pattern of expression in each tissue, the so-called 'inner fish'.

The strongest similarities were seen in brain tissue. Hughes said, "This relatively low divergence of gene expression in brain supports the

hypothesis that neurons participate in more functional interactions than cells in other tissues - imposing constraints on the degree of alteration that can be tolerated". Genes expressed in tissues subject to greater environmental influence (such as intestine, stomach and spleen) may be more likely to take on new roles and diverge in expression as a means of adaptation.

Although this study only investigated vertebrates, these expression profiles may go much further back into our past. The authors conclude, "It is likely that the conservation of gene expression extends beyond the base of vertebrates, coexpression of neuronal genes, for example, has been observed as far as nematodes".

More information: Conservation of core gene expression in vertebrate tissues, Esther T Chan, Gerald T Quon, Gordon Chua, Tomas Babak, Miles Trochesset, Ralph A Zirngibl, Jane Aubin, Michael Ratcliffe, Andrew Wilde, Michael Brudno, Quaid D Morris and Timothy R Hughes, Journal of Biology (in press), jbiol.com/

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