Researchers find the root of the evolutionary emergence of vertebrates

February 11 2008

Dartmouth College researchers and colleagues from the University of Bristol in the U.K. have traced the beginnings of complex life, i.e. vertebrates, to microRNA. The researchers argue that the evolution of microRNAs, which regulate gene expression, are behind the origin of early vertebrates.

“This study not only points the way to understanding the evolutionary origin of our own lineage, but it also helps us to understand how our own genome was assembled in deep time,” says Kevin Peterson, an author on the paper and an associate professor of biological sciences at Dartmouth.

Their study was published on February 11, 2008, issue of the *Proceedings of the National Academy of Sciences*.

Peterson worked with Dartmouth graduate student Alysha Heimberg, Vanessa Moy, a Dartmouth biology research assistant, and Lorenzo Sempere, a researcher with Dartmouth Medical School. Philip Donoghue of Bristol University’s Department of Earth Sciences was also a co-author. They showed that microRNAs, a class of tiny molecules only recently discovered residing within what has usually been considered junk DNA, are hugely diverse in even the most lowly of vertebrates, but relatively few are found in the genomes of our invertebrate relatives.

“There was an explosive increase in the number of new microRNAs added to the genome of vertebrates and this is unparalleled in evolutionary history,” says Heimberg.

The team studied the genomics of primitive living fishes, such as sharks and lampreys, and their spineless relatives, like the sea squirt. By reconstructing the acquisition history of microRNAs shared between human and mice, the researchers determined that the highest rate of microRNA innovation in the vertebrate lineage occurred before the divergence between the living jawless fishes like the lamprey and the jawed fishes like the shark, but after the divergence of vertebrates from their invertebrate chordate relatives, such as the sea squirt.

Co-author Donoghue adds, “Most of these new genes are required for the growth of organs that are unique to vertebrates, such as the liver, pancreas and brain. Therefore, the origin of vertebrates and the origin of these genes is no coincidence.”

Source: Dartmouth College