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Transposable elements as a source of genetic innovation: expression and evolution of a family of retrotransposon-derived neogenes in mammals

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Abstract

A family of functional neogenes called *Mart*, related to the *gag* gene of Sushi-like long terminal repeat retrotransposons from fish and amphibians, is present in the genome of human (11 genes) and other primates, as well as in mouse (11 genes), rat, dog (12 genes), cat, and cow. *Mart* genes have lost their capacity of retrotransposition through non-functionalizing rearrangements having principally affected long terminal repeats and *pol* open reading frame. Most *Mart* genes are located on the X chromosome in different mammals. Sequence database analysis suggested that *Mart* genes are present in opossum (marsupial), but absent from the genome of chicken. Hence, the *Mart* gene family might have been formed from Sushi-like retrotransposon(s) after the split of birds and mammals (310 myr ago), but before the divergence between placental mammals and marsupials (170 myr ago). RT-PCR analysis showed that at least six *Mart* genes are expressed during mouse embryonic development, with in situ hybridization analysis revealing rather ubiquitous expression patterns. *Mart* expression was also detected in adult mice, with some genes being expressed in all tissues tested, while others showed a much more restricted expression pattern. Although additional analysis will be required to establish the function of the retrotransposon-derived *Mart* neogenes, these observations support the evolutionary importance of retrotransposable elements as a source of genetic novelty.

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