Molecular co-evolution of kisspeptins and GPR54s

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Kisspeptin and its receptor, GPR54, play a pivotal role in vertebrate reproduction. Recent advances in bioinformatic tools combined with comparative genomics have led to the identification of a large number of kisspeptin and GPR54 genes in a variety of vertebrate species. Genome duplications may have produced at least two isoforms of both ligand (KiSS1 and KiSS2) and receptor (GPR54-1 and GPR54-2). Additional isoforms of kisspeptin (KiSS1b) and GPR54 (GPR54-1b) have been found in an amphibian species, Xenopus (Silurana) tropicalis. Here, we discuss the evolutionary lineages of these kisspeptin and GPR54 isoforms using genome synteny and phylogenetic analyses, and possible molecular interactions between kisspeptin and GPR54 subtypes based on ligand-receptor selectivity. Together, kisspeptin and GPR54 provide an excellent model for understanding molecular coevolution of the peptide ligand and GPCR pairs.