Trace amine-associated receptors (TAARs) in mammals recently have been shown to function as olfactory receptors. We have delineated the taar gene family in jawless, cartilaginous and bony fish (zero, two, and more than hundred genes, respectively). We conclude that taar genes are evolutionary much younger than the related OR and OGRAVtR olfactory receptor families, which are present already in lamprey, a jawless vertebrate. The two cartilaginous fish genes appear to be ancestral for two taar classes, each with mammalian and bony fish (teleost) representatives. Unexpectedly, a whole new clade, class III, of taar genes originated even later, within the teleost lineage. Taar genes from all three classes are expressed in subsets of zebrafish olfactory receptor neurons, supporting their function as olfactory receptors. Expression of most TAAR genes in 5dpf zebrafish is found restricted to olfactory epithelium (OE). The highly conserved TAAR1 (shark, mammalian and teleost orthologs) is not expressed in the olfactory epithelium and may constitute the sole remnant of a primordial, non-olfactory function of this family. Class III comprises three-fourths of all teleost taar genes, and is characterized by the complete loss of the amine-specific ligand-binding motif, strongly conserved in the other two classes. Two independent intron gains in class III taar genes represent extraordinary evolutionary dynamics considering the virtual absence of intron gains during vertebrate evolution. The dNaS analysis suggests both minimal global negative selection and an unparalleled degree of local positive selection as another hallmark of class III genes. The accelerated evolution of class III teleost taar genes conceivably might mark the birth of a new olfactory receptor gene family.

References: