Evolution of two odorant-binding protein genes, *Obp57d* and *Obp57e*, in *Drosophila*

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Two odorant-binding proteins, OBP57d and OBP57e, are involved in the evolution of unique host-plant preference in *Drosophila sechellia*. *D. sechellia* exclusively reproduces on the ripe fruit of *Morinda citrifolia* (Tahitian Noni), which contains octanoic acid that is toxic to other *Drosophila* species. Behavioral analysis of *D. melanogaster* knockout strains suggested that OBP57d and OBP57e participate in the taste perception of octanoic acid, and modulate female preference in the selection of egg-laying sites. Comparisons of genomic sequences at the *Obp57d/e* locus from 27 *Drosophila* species revealed that the OBP gene number at this locus is different between species. Phylogenetic analysis suggested that *Obp57d* and *Obp57e* arose by gene duplication at the early stage of the *melanogaster* species group evolution, followed by differentiation of the ORF sequences from each other. There are interspecific differences in the expression pattern of *Obp57d* and *Obp57e*. Behavioral analysis of various species revealed that the feeding preference for octanoic acid correlates negatively with the OBP expression level in the mouthparts. Gene duplication and the subsequent ORF differentiation, as well as changes in the expression pattern, could be important evolutionary mechanisms by which OBP genes develop their functional diversity, promoting the behavioral evolution among species.