Genome provides insights into metamorphosis mechanism of Rapana venosa based on G protein-coupled receptor superfamily

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Résumé

Metamorphosis is an important stage during the development of marine invertebrates, as well as the significant event in the evolution of the animal life history. The G protein-coupled receptors (GPCR) superfamily plays an important role in the metamorphosis of invertebrates, including sensing the external environment, recognizing metamorphosis-inducing factors, and regulating the metamorphosis process. Rapana venosa, a typical carnivorous gastropod, invades all over the world as a predator. There is a dietary shift during its metamorphosis, which significantly distinguishes it from other bivalves and herbivorous gastropods. In this study, we assembled the first chromosome-level genome of R. venosa, the size is 2.30 Gb, encoding 29,649 genes, and 45 gene families significantly expanded which were mainly enriched in the pathways related to environmental sensing and signal transduction involved GPCR. After further identification of the GPCR, 828 members were found in the genome of R. venosa, significantly more than that of other molluscs. More than 50% of GPCRs were specifically expressed in the osphradium, indicating that osphradium is the main sensory organ, which may be critical in larval metamorphosis. Additionally, some GPCR member showed significant changes during the larval metamorphosis or under the induction of oyster, including orexin receptors, metabotropic glutamate receptors, cholecystokinin receptors, and so on, which may play important roles in the metamorphosis cues perception and the metamorphosis regulation. These results may broaden the understanding of the developmental biology of marine invertebrates and important for promoting the protection of the diversity of marine invertebrates and addressing issues of marine biological invasions.

Mots-Clés: GPCR gene superfamily, Rapana venosa, Genome, Metamorphosis.

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