

Molecular mechanisms of shell coiling in gastropods

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Various shapes of gastropod shells have evolved ever since the Cambrian. Although theoretical analyses of morphogenesis exist, the molecular basis of shell development remained unclear. We compared expression patterns of the decapentaplegic (dpp) gene in the mantle tissues at various developmental stages between coiled and non-coiled shell gastropods. In the two non-coiled shell limpets, *Patella vulgata* and *Nipponacmea fuscoviridis*, the dpp showed symmetric expression pattern at the mantle edge. On the other hand, in the dextral snail *Lymnaea stagnalis*, dpp is expressed at the right-hand side of the mantle. Moreover, we analyzed the functions of dpp using the Dpp signal inhibitor dorsomorphin in order to understand developmental mechanisms and evolution of shell formation in gastropods. When the embryos were treated with Dpp signal inhibitor at the trochophore and veliger stage after the shell gland formation, juvenile shells grew to show a cone-like form rather than a normal coiled form. These results suggest that the dpp gene plays important roles in the shell coiling in gastropods.

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