Two chitin metabolic enzyme genes from *Hyriopsis cumingii*: cloning, characterization, and potential functions

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Received January 23, 2012
Accepted June 22, 2012
Published October 15, 2012
DOI http://dx.doi.org/10.4238/2012.October.15.4

ABSTRACT. Chitin, the second most important natural polymer in the world, and its N-deacetylated derivative chitosan are found in a wide variety of organisms. These versatile biopolymers are associated with a broad range of biological functions. This article is the first to report the potential functions of 2 chitin metabolic enzyme genes from *Hyriopsis cumingii*. A chitinase-3 gene (*Chi-3*) and a chitin deacetylase gene (*Cda*) were cloned from *H. cumingii* and characterized. Semi-quantitative reverse transcription polymerase chain reaction analysis revealed that the *Cda* gene was expressed in blood, mantle, liver, stomach, kidney, intestine, gill, and foot, whereas *Chi-3* was also expressed in those tissues but not in blood. The tissue-specific expression of *H. cumingii Chi-3* indicated that other *Chi* genes may be involved in the *H. cumingii* immune system. Real-time quantitative polymerase chain reaction analysis showed that the expression of *Chi-3* was significantly (P < 0.05) upregulated 12 h after shell damage, suggesting that *Chi-3* might hydrolyze superfluous chitin after shell recovery and play a role in shell formation. Conversely, *Cda* expression did not change significantly (P
> 0.05) to maintain a certain degree of acetylation in chitin/chitosan. This study enriches the basic research on chitin metabolic genes and lays foundations for further research of shell regeneration in mussels.

**Key words:** *Hyriopsis cumingii*; Chitinase-3 gene; Potential functions; Chitin deacetylase gene; Expression