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The expression of superoxide dismutase in *Mytilus coruscus* under various stressors

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Abstract: Superoxide dismutases (SODs), a by-product of antioxidative defence system, protects organisms for eliminating excess reactive oxygen species (ROS) and maintaining the redox balance of immune system. The complete open reading frames (ORFs) of Cu/Zn-SOD and Mn-SOD were identified from *Mytilus coruscus* (designated as McSOD and MnSOD) by homologous cloning. The sequence lengths were 474bp and 687bp, encoding 157 and 228 amino acids respectively. The deduced amino acid sequences of McSOD and MnSOD shared high identities with Cu/Zn-SOD and Mn-SOD from other mollusca. The distributions of McSOD and MnSOD were detected in six tissues including adductor, hemocyte, gill, gonad, mantle and hepatopancreas, and the highest expressions were both in gills. The temporal expression of McSOD and MnSOD were up-regulated in gills under a variety of stress factors, including *Vibrio parahemolyticus*, *Aeromonas hydrophila*, Cu^{2+} and Pb^{2+}. After being challenged with *V. Parahemolyticus*, the expressions of McSOD and MnSOD were increased rapidly at the initial hours, reaching the peaks of 4.9-fold and 15.3-fold respectively, and got to the highest levels of 43.5-fold and 7.1-fold after being challenged with *A. hydrophila*. The highest point of McSOD mRNA appeared at 15d after being exposed to copper (7-fold at 0.5mg/L and 13.2-fold at 1.5mg/L), except for 0.1mg/L group of Cu^{2+} maintaining to the normal level, but plumbum at 1d (2.4-fold at 1.0mg/L and 4.4-fold at 3.0mg/L) and at 15d (2.1-fold at 0.2mg/L). The temporal expression peaks of MnSOD appeared differently after exposing to copper of various concentrations (0.1mg/L at 10d with 4.7-fold, 0.5mg/L at 1d with 17.9-fold and 1.5mg/L at 3d with 13.2-fold). Whereas in plumbum exposing treatments, the 3.0mg/L group jumped to the peak at 1d (18.2-fold), the 0.2mg/L and 1.0mg/L groups had little change and maintained at the normal level throughout the experiment. The results provided several new evidences for further understanding of the regulatory mechanism of SOD on the innate immune system in bivalve.

Keyword: Superoxide dismutases; Reactive oxygen species (ROS); *Vibrio parahemolyticus*, *Aeromonas hydrophila*; Heavy metals; *Mytilus coruscus*

1. Introduction

As an essential response formation of innate immunity, the reactive oxygen species (ROS) response is generated from large amounts factors such as diseases, pathogenic

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