

Depuration of copper and zinc by green oysters and blue mussels of Taiwan.

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Abstract

This paper describes depuration processes of copper and zinc in green oysters (*Crassostrea gigas*) and in blue mussels (*Mytilus smaragdium*) collected from an environment with heavy copper contamination, and then transferred to natural clean seawater. Results show that the total loss of copper content per oyster is an exponential function of exposure time for the first 6 days with a depuration rate of 351 $\mu\text{g g}^{-1} \text{ day}^{-1}$ and then levels off. During this exponential decrease period approximately 67% of the copper accumulated in green oysters was depurated. However, when the copper contents in the oysters decreased from 2225 $\pm$ 111 $\mu\text{g g}^{-1}$ to 344 $\pm$ 18.7 $\mu\text{g g}^{-1}$ the depuration rates decreased from 245 $\mu\text{g g}^{-1} \text{ day}^{-1}$ to 0.08 $\mu\text{g g}^{-1} \text{ day}^{-1}$. This means that green oysters had a 16-fold higher copper depuration rate (351 $\mu\text{g g}^{-1} \text{ day}^{-1}$) than normal oysters (21.5 $\mu\text{g g}^{-1} \text{ day}^{-1}$) for the first 6 days. However, the depuration of accumulated copper and zinc by the mussels was a fast process in natural clean seawater. About 91% of the accumulated copper was lost during the first 6-day period; copper contents declined from 20.2 $\pm$ 3.41 $\mu\text{g g}^{-1}$ to 1.80 $\pm$ 0.21 $\mu\text{g g}^{-1}$. Only 36% of the accumulated zinc was lost during a depuration period of 6 days. Calculations show that the biological half-lives of copper in green and normal oysters were 11.6 and 25.1 days, respectively. The biological half-lives of zinc in green and normal oysters were 16.7 and 30.1 days, respectively. In spite of the relatively low initial copper content in blue mussels being 20.2 $\pm$ 3.41 $\mu\text{g g}^{-1}$, the biological half-life is only 6.40 days. From these results it is important to emphasise that the fastest turnover rate is for copper in blue mussels. However, zinc is more retentive in blue mussels than copper.