The Role of Catalase during Anoxia and Reoxygenation in Gastropods

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The importance of each individual antioxidant enzyme for the adaptation of hypoxic tolerant animals to cycles of anoxia and reoxygenation is not well understood. The aim of this work was to assess the role of catalase in land snails *Helix aspersa* during post-anoxic reoxygenation by the suppression of its activity with aminotriazole (ATZ) injection. Catalase activity in foot muscle fell 60% after ATZ administration. ATZ alone resulted in no alterations in the activity of antioxidant enzymes, GSH levels, and oxidative stress markers (OSM): TBARS, carbonyl protein and GSSG:GSH ratio. Anoxia induced a rise in foot Se-GPX activity in saline- and ATZ-injected animals (1.8-2.0 fold). This elevated Se-GPX activity rapidly returned to normal levels at the onset of reoxygenation, whereas this return to normal activity happened 60 min later in ATZ-injected animals. Reoxygenation caused no changes in OSM in foot of saline- or ATZ-injected snails. In hepatopancreas, most parameters remained unchanged in response to ATZ (which suppressed 69% of catalase activity), anoxia or reoxygenation. Anoxia caused a tendency for the increase in Se-GPX activity in both groups ($p=0.06$ for saline and $p=0.10$ for ATZ) and only punctual and small increases in carbonyl protein during reoxygenation in ATZ-injected animals. These data show that *Helix aspersa* present an efficient antioxidant system, since oxidative stress was not observed during reoxygenation – even in tissues with catalase suppression. This suggests that activation of Se-GPX activity during anoxia (a process unaffected by ATZ) played a key adaptive role in reoxygenation. The activation of Se-GPX is also encountered in other mollusks during hypoxia/anoxia exposure, which is associated with minor oxidative stress.

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