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Abstract

Anopheles mosquitoes have been shown to adapt to heavy metals in their natural habitats. In this study we explored the possibility of using Anopheles gambiae sensu stricto as bio-reporters for environmental heavy metal pollution through expressions of their metal-responsive metallothionein and alpha-tubulin genes. The study was undertaken with third instar larvae after selection by cadmium, copper, or lead at LC(30) through five successive generations. Expression levels were determined in the 5th generation by semi-quantitative RT-PCR on the experimental and control populations. The data were analyzed using one-way ANOVA. The highest metallothionein ($F(3,11)=4.574$, $P=0.038$) and alpha-tubulin ($F(3,11)=12.961$, $P=0.002$) responses were observed in cadmium-tolerant treatments. There was significantly higher expression of metallothionein in cadmium or copper treatments relative to the control ($P=0.012$), and in cadmium than in lead treatments ($P=0.044$). Expressions of alpha-tubulin were significantly higher in cadmium than in control treatments ($P=0.008$). These results demonstrate the capacity of An. gambiae s.s. to develop tolerance to increased levels of heavy metal challenge. The results also confirm the potential of heavy metal-responsive genes in mosquitoes as possible bio-indicators of heavy metal environmental pollution. How the tolerance and expressions relate to An. gambiae s.s. fitness and vectorial capacity in the environment remains to be elucidated.