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Comparison of methods for acute and chronic toxicity in marine sediments

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ABSTRACT

Sublethal test methods are being used with increasing frequency to measure sediment toxicity, but little is known about the relative sensitivity of these tests compared to the more commonly used acute tests. A study was conducted to compare the sensitivity of several acute and sublethal toxicity methods and investigate their correlations with sediment chemistry and benthic community condition. Six sublethal methods (amphipod: *Leptocheirus plumulosus* 28-day survival, growth and reproduction; polychaete: *Neanthes arenaceodentata* 28-day survival and growth; benthic copepod: *Amphiascus tenuiremis*, 14-day life-cycle; seed clam: *Mercenaria mercenaria* 7-day growth; oyster: *Crassostrea virginica* lysosome destabilization; and sediment-water interface testing with embryos of the mussel *Mytilus galloprovincialis*) and two acute methods (10-day amphipod survival with *Eohaustorius estuarius* and *Leptocheirus plumulosus*) were used to test split samples of sediment from stations in southern California and San Francisco Bay. The life-cycle test with the copepod, *Amphiascus*, proved to be the most sensitive sublethal test and the most sensitive test overall. The *Leptocheirus* 10-day survival test was the most sensitive of the acute tests. In general, the sublethal tests were not more sensitive to sediments than the acute tests. Of the sublethal tests, only the *Amphiascus* endpoints and polychaete growth correlated with sediment chemistry. There was poor correspondence between the toxicity endpoints and indicators of benthic community condition. Differences in test characteristics such as mode of exposure, species-specific contaminant sensitivity, changes in contaminant bioavailability, and the influence of noncontaminant stressors on the benthos may have been responsible for variation in response among the tests and low correspondence with benthic community condition. The influence of these factors cannot be easily predicted, underscoring the need to use multiple toxicity methods in combination with other lines of evidence to provide an accurate and confident assessment of sediment toxicity.

Full Text

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