SWAMP
Surface Water
Ambient Monitoring
Program

SEDIMENT TOXICITY IDENTIFICATION EVALUATION: ADVANCING PROCEDURES FOR EXTRACTING AND RECOVERING CHEMICALS OF CONCERN IN INTERSTITIAL WATER

What is it?

Sediment toxicity identification evaluation (TIE) techniques are the primary tool used to identify specific chemicals responsible for toxicity. Current sediment TIE procedures are conducted on whole sediment or interstitial water (subsurface water contained in pore spaces between the grains of rock and sediment), and can generally characterize the cause of toxicity (Phase I), but are less effective at identifying specific chemicals causing toxicity (Phase II). Most whole sediment treatments are Phase I procedures that characterize the cause of toxicity as metal, organic, ammonia, or a combination of these contaminants. Phase II procedures are better adapted to interstitial water because this matrix is easier to manipulate using standard TIE treatments.

This study was designed to improve procedures for extracting and recovering two chemicals of concern, the organophosphate pesticide chlorpyrifos and the pyrethroid pesticide bifenthrin, from sediment interstitial water. The experiments tested different extraction methods and different solvents for eluting the extraction media. The experiments also used different combinations of the two pesticides. Tests were conducted using natural fresh interstitial water and the amphipod Hyalella azteca.

Why is it important?

Hydrophobic contaminants (those tending not to combine with, or are incapable of dissolving in water) discharged into aquatic environments quickly associate with suspended particulates and accumulate in depositional areas. Accumulated contaminants can be toxic to benthic organisms, and sediment toxicity is commonly observed in marine and freshwater habitats throughout California. Chlorpyrifos and bifenthrin have been shown to be responsible for sediment toxicity in California's Central Valley and the central coast, but improved TIE procedures are needed so the specific chemical causing toxicity can be identified in more cases.

Making informed management decisions to protect water quality depends on our ability to identify the chemical or chemicals responsible for sediment toxicity. Knowing the specific chemical is essential so that appropriate source reduction measure can be developed.

How will this information be used?

This study was designed to build on the results of similar work funded by the San Francisco Estuary Institute and the San Francisco Bay Regional Monitoring Program Toxicity Workgroup and recommendations from a workshop they organized. The study provides information to help improve interstitial water extraction methods in freshwater samples so that more effective Phase I and II TIE tools can be developed. However, more experiments are necessary to refine these tools.

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