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A tiered assessment framework to evaluate human health risk of contaminated sediment

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ABSTRACT

For sediment contaminated with bioaccumulative pollutants (e.g., PCBs and organochlorine pesticides), human consumption of seafood that have bioaccumulated sediment-derived contaminants is a well-established exposure pathway. Historically, regulation and management of this bioaccumulation pathway has focused on site-specific risk assessment. The state of California (USA) is supporting the development of a consistent and quantitative sediment assessment framework to aid in interpreting a narrative objective protecting human health. The conceptual basis of this framework focuses on two key questions: 1. Do observed pollutant concentrations in seafood from a given site pose unacceptable health risks to human consumers? 2. Is sediment contamination at a site a significant contributor to seafood contamination? The first question is evaluated by interpreting seafood tissue concentrations at the site, based on health risk calculations. The second question is evaluated by interpreting site-specific sediment chemistry data using a food web bioaccumulation model. The assessment framework includes three tiers (screening assessment, site assessment, and refined site assessment), which enables the assessment to match variations in data availability, site complexity, and study objectives. The second and third tiers use a stochastic simulation approach, incorporating information on variability and uncertainty of key parameters, such as seafood contaminant concentration and consumption rate by humans. The framework incorporates site-specific values for sensitive parameters and statewide values for difficult to obtain or less sensitive parameters. The proposed approach advances risk assessment policy by incorporating local data into a consistent region-wide problem formulation, applying best available science in a streamlined fashion.

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