

## TOXICOKINETICS OF SEDIMENT-SORBED BENZO[*a*]PYRENE AND HEXACHLOROBIPHENYL USING THE FRESHWATER INVERTEBRATES *HYALELLA AZTECA*, *CHIRONOMUS TENTANS*, AND *LUMBRICULUS VARIEGATUS*

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(Received 11 February 2002; Accepted 13 August 2002)

**Abstract**—This study investigated the effect of long-term sediment aging on the toxicokinetics of benzo[*a*]pyrene (BaP) and hexachlorobiphenyl (HCBP) using three freshwater benthic invertebrates. *Hyalella azteca*, *Chironomus tentans*, and *Lumbriculus variegatus* were exposed to BaP- and HCBP-spiked sediments that were aged for 7 d or 1.5 years. The toxicokinetics of the two compounds were determined for each test organism using a two-compartment model. The modeling of BaP was more complex because biotransformation was included within the model. The results of this study showed that the HCBP uptake clearance rates ( $k_s$ ) for each species were generally an order of magnitude greater than those determined for BaP and this difference was most likely due to preferential and rapid binding of BaP to sediment particles. Overall, the bioavailability of HCBP in spiked sediments tended to decrease with duration of aging, based on  $k_s$  values and bioaccumulation factors (BAFs). However, the decreases in bioavailability appear to be species specific. Benzo[*a*]pyrene did not decline in bioavailability for the species tested because it may resist movement into the micropores of the sediment due to its large size. In addition to the bioassays, this article outlines a method for toxicokinetic modeling of biotransformed compounds and methods for statistical comparisons of kinetic parameters (i.e.,  $k_s$ ,  $k_d$  ...) and BAF values.

**Keywords**—Toxicokinetics Bioavailability Benzo[*a*]pyrene