

Measuring bioconcentration factors of sediment-associated fipronil in *Lumbriculus variegatus* using passive sampling techniques

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ABSTRACT

Fipronil and its degradates have been detected ubiquitously in aquatic environment worldwide, yet little is known about its bioaccumulation potential. The goal of the present study was to measure bioconcentration factor (BCF) of sediment-associated fipronil in a benthic invertebrate, *Lumbriculus variegatus* using passive sampling techniques. Three passive samplers including polymethyl methacrylate (PMMA) film, poly(dimethylsiloxane) fiber and polyacrylate fiber were evaluated. PMMA film was identified as the preferred method and was applied to determine fipronil log KOC (3.77 ± 0.04). BCF of sediment-associated fipronil in *L. variegatus* was obtained through measuring freely dissolved concentration (C_{free}). Because fipronil degraded in sediment, time weighted average (TWA) C_{free} was estimated for calculating BCFTWA (1855 ± 293 mL/g lipid). Fipronil BCF was also measured in a water-only bioaccumulation test of *L. variegatus* under constant exposure condition. This BCF value (1892 ± 76 mL/g lipid) was comparable with the BCFTWA, validating effectiveness of the passive sampling method for the measurement of sediment C_{free} . Fipronil was bioaccumulative in *L. variegatus* according to the USEPA's criteria. The combination of C_{free} and TWA concentration measurements was demonstrated to properly determine BCF value for moderately hydrophobic and degradable chemicals in sediment.

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