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Bioconcentration of Lipophilic Chemicals under Nonconstant Exposure Conditions

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This paper presents a bioconcentration model where the concentrations of lipophilic chemicals continuously change over time both in organisms and in water while incorporating volatilization, biochemical degradation, or sediment interaction terms. The model was developed based on a mass balance numerical approach and validated against data obtained from the bioconcentration of *trans*- and *cis*-chlordane into goldfish (*Carassius auratus*). Using the non-constant exposure model allows us to develop two new experimental parameters: critical time (T_c) and critical concentration (C_c). These values would be the most important indicator to assess the ecological risk of chemicals under the nonconstant exposure conditions. They are largely dependent upon volatilization and biochemical degradation in water and the metabolism in fish, as well as the uptake and elimination rates. Based on this investigation, the use of the non-constant exposure model may more accurately reflect the bioconcentration in natural systems, where the aqueous concentration of organic chemicals may significantly change over time.

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Development of a Multimedia Toxicokinetic Model for Bioavailability Assessment of Synthetic Organic Chemicals

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A multimedia toxicokinetic model was developed for bioaccumulation of toxic chemicals where the presence of sediment is considered as an important factor controlling the bioavailability of lipophilic compounds. Based on a three compartment dynamic system, the fate and transport of chemicals was described by a set of simultaneous first-order ordinary differential equations. These equations were numerically solved by employing the fourth order Runge-Kutta method. The model was applied to experimental data obtained in a static bioaccumulation study where goldfish (*Carassius auratus*) were exposed to *trans*- and *cis*-chlordane in the presence of muck sediment. The sediment contained high organic matter and decreased the amount of chemicals available to the fish. The model was calibrated against the time course of chlordane concentrations in three compartments, based on the experimental conditions, such as water sediment partition ratio, volatilization rate, and mass balances between the three compartments. There was good comparison between model predictions and the experimental results for both chemicals in all compartments.