Terrestrial risk assessment for linear alkyl benzene sulfonate (LAS) in sludge-amended soils

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Abstract

A comparison of the estimated environmental concentration and the effect concentrations (in the laboratory or field) in the receiving compartment form the basis of environmental risk assessments. This paper reviews processes that critically influence the fate of LAS in the terrestrial environment. Concentrations of LAS in sludge are quite high due to sorption to primary sludge, precipitation of Ca and Mg-salts of LAS, and lack of biodegradation under anaerobic digestion. This implies that when sludge is applied to soil e.g. as a fertilizer, considerable amounts of this important surfactant may enter the terrestrial environment. Influence of aerobic situations on LAS concentrations during sludge storage needs further research to allow incorporation into the risk assessment. Aerobic biodegradation in soil is considered the most important removal mechanism of LAS loading to the terrestrial environment through sludge-amendment. Sorption plays a role in determining the residence time of a chemical in the soil, hereby enabling more time for biodegradation to occur. In addition, sorption may affect the expression of effects of surfactants towards benthic and soil dwelling organisms and plants. Another factor that needs further attention is the form of LAS in the environment, which is not similar to the commercial material applied in detergents. The differential sorption and biodegradation of the LAS components lead to a shift in the alkyl chain length (homologue), and phenyl-isomer distribution towards increased hydrophobicity. Also, occurrence of CaMg-salts in the environment versus the Na-salt for the commercial material critically impacts the extrapolation of effects data obtained in lab studies (mostly performed with the commercial material) to the field. The literature data were used in combination with strategies and methods provided by the European Union Technical Guidance Document in support of risk assessment of new and notified substances (1996) for the prediction of environmental concentrations of LAS entering the soil system through sludge applications.Soil biodegradation is an essential, necessary element for the PEC-calculations of LAS. The initial realistic worst case assessment presented indicates no human health risks exists with indirect exposure to LAS through either food or drinking water. Also, current LAS use does not pose a risk to terrestrial organisms such as plants and invertebrates.