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Impact, Risk and Life Cycle Assessment

BIOAVAILABILITY PROCESSES FOR CONTAMINANTS IN SOILS AND THEIR USE IN RISK ASSESSMENT

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Abstract

The individual physical, chemical, and biological interactions that determine the exposure of plants and animals to chemicals associated with soils are of great importance in the assessment of contaminants bioavailability. Understanding of bioavailability processes is at last needed to improve the scientific basis of risk assessment and is the purpose of the present research.
Since bioavailability processes are embedded within existing human health and ecological risk frameworks, sorption efficiency of contaminants is assumed as the bioavailability factor and used as an adjustment to applied dose. Various soils and contaminants (dyes, refractory organics, heavy metals) were contacted and the maximum sorbed concentrations were determined in various experimental conditions using a batch system. Inorganic and organic contaminants associated with soils can be transported to biological receptors by a variety of pathways in environmental systems. The released concentrations of contaminants were assessed by desorption experiments using distilled water. These data were applied for bioavailability assessment.
The intake equation for incidental ingestion, as an important exposure route for contaminated soils in human health risk assessments was used in its basic form, which includes chemical concentration in the soil at the point of contact, soil ingestion rate, body weight. The soil concentration, surface area, adherence factor, and body weight terms allow calculation of an amount of chemical present on the skin per unit body weight, applying an adequate equation to calculate the absorbed dose from dermal exposure to soil. Depending on which exposure pathways dominate, different bioavailability processes were considered during ecological risk assessment, according to specific methods.
This way bioavailability can be considered as having a potential influence on risk-based decision-making processes for remedial goals.

Key words: bioavailability, persistent pollutants, risk assessment, sorption

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