

Surveying soil-to-plant PFOS transfer factors in perennial forages across Maine, US

Perfluorooctane sulfonic acid (PFOS) is an emerging health risk linked to carcinogenic and immunotoxic effects, among others. A major route of human exposure is through milk and beef from cows fed hay grown on contaminated land. To identify fields of potential concern, soil screening levels have been established, starting with a prescribed PFOS action level for milk or beef and back-calculating using existing soil-to-fodder and fodder-to-meat or cow's milk transfer factors. Problematically, the soil-to-plant transfer factors that such calculations rely upon are highly variable from site to site and even field to field on a given farm. In this study, we sought to find connections between various soil and plant characteristics and soil-to-plant transfer factors from 25 sites across the state of Maine. Soil and plant characteristics considered included soil texture, pH, cation exchange capacity, phosphorus, iron, and total organic carbon, and plant growth stage, soluble protein, and starch. Co-located soil and plant samples were taken and submitted for PFOS concentration, soil chemical and physical characterization, and forage quality analyses. PFOS levels were determined using the Department of Defense Quality Systems Manual 5.1 (DoD QSM 5.1) method with plant samples undergoing cryogrinding prior to analysis. Forage quality analysis was conducted using near-infrared spectroscopy. A combination of standard statistical analysis as well as principal component analysis was used to find relationships between soil and plant characteristics and PFOS transfer factors. Preliminary results show a relationship between plant part and PFOS accumulation and plant species (legume versus grass) and PFOS levels.