Fate and Transport of Biosolids-Borne Triclosan (TCS)

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Triclosan (TCS) is an active ingredient in antibacterial liquid soaps, personal care products, and a common constituent of domestic wastewater. Activated sludge treatment readily removes TCS from the liquid waste stream and concentrates the antimicrobial in the solid fraction, which is often processed to produce biosolids. Greater than half of the biosolids generated in the US are land-applied, resulting in a systematic release of biosolids-borne TCS into the terrestrial environments. Terrestrial risk assessment is necessary to address the concerns about the risks of biosolids-borne TCS to humans and environment. The objective of our study was to determine the half-life of TCS, and to identify the metabolites in biosolids-amended soils. A laboratory biodegradation study was conducted using a biosolids spiked with ^{14}C-TCS (concentration = 41 mg kg^{-1}) amended to Immokalee fine sand and Ashkum silty clay loam at agronomic rates (22 Mg ha^{-1}). The 18-week study revealed minimal (<0.5%) mineralization (conversion to $^{14}CO_2$) of ^{14}C-TCS, but a degradation metabolite (Methyl TCS) was detected at week 4. The primary degradation half-life (TCS to Methyl TCS) was estimated as 77 d in the Ashkum silty clay loam and >126 d in the Immokalee fine sand. Half-life estimates are similar to the 56-107 d reported in other studies, but greater than half-lives reported in unamended soils (18-58 d) Future work will include the investigation of possible TCS plant uptake and effects on soil organisms from land applied biosolids. The results will contribute to an improved TCS risk assessment for the routine land application of biosolids to soils.