

## PHASE DISTRIBUTION OF SYNTHETIC PYRETHROIDS AND BIODEGRADATION

Sangjin Lee<sup>1,2</sup>, Jay Gan<sup>1</sup>

<sup>1</sup> Department of Environmental Sciences, University of California, Riverside,  
California 92521, USA

<sup>2</sup> Pollution Response Division, National Maritime Police Agency, Incheon,  
Republic of Korea

Synthetic Pyrethroids (SPs) are a group of hydrophobic compounds with significant toxicity. Their strong affinity to suspended solids and humic materials suggests that SPs in natural surface are distributed in solid-adsorbed, dissolved organic matter (DOM)-adsorbed, and freely dissolved phases. The freely dissolved phase is of particular importance because of its mobility and bioavailability. In stream water, most SPs were associated with the suspended solids and, to a lesser extent, with DOM. The freely dissolved phase contributed only 0.4% to 1.0% into adsorbed phases implies that the toxicity of SPs in surface water is reduced because of decreased bioavailability. Fifty-six of SP-degrading bacteria strains were isolated from contaminated sediments, of which six were evaluated for their ability to transform bifenthrin and permethrin in the aqueous phase and bifenthrin in sediment phase. In the aqueous phase, bifenthrin was rapidly degraded by strains of *Stenotrophomonas acidaminiphila*, and the half-life ( $t_{1/2}$ ) was reduced from >700h to 30 to 131h. Bifenthrin  $t_{1/2}$  was 343 to 466h for a field sediment, and increased to 980 to 1200h for a creek sediment containing higher organic carbon content. Therefore, although SP-degrading bacteria may be widespread in aquatic systems, adsorption to sediment to sediment could render SPs unavailable to the degraders, thus prolonging their persistence.