

Fate and Partitioning of Selected Pharmaceuticals in Aquatic Environment

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Two nonsteroidal anti-inflammatory drugs (NSAIDs), ibuprofen and acetaminophen, a β -blocker atenolol, and an antidepressant fluoxetine were selected, and their sorption coefficients (K_{oc} values) on the basis of dissolved organic matter (DOM) and model sediments were determined. The highest values were found for fluoxetine for both DOM and sediments, followed by atenolol or ibuprofen. These K_{oc} values were comparable to those of pyrene and 17β -estradiol, a nonpolar four-ring polycyclic aromatic hydrocarbon and a polar natural estrogen, respectively. For these four pharmaceuticals, partition coefficients between synthetic membrane vesicles (liposomes) and water (K_{lipw} values), and removal efficiencies for a simple batch activated sludge treatment were also determined. The highest K_{lipw} values were again found for fluoxetine followed by atenolol. The removal efficiency for a 6-hour batch activated sludge treatment was over 90% for the two NSAIDs whereas that for atenolol was as low as 10%; both agreed with the results obtained in conventional studies, which showed the concentration in the influent and effluent of sewage treatment plants. The removal efficiency for fluoxetine was also over 90%, but it was sorbed by sludge and not biodegraded.

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