



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003CT23B

Title: Occurrence and Fate of Pharmaceuticals in the Pomperaug River

Project Type: Research

Focus Categories: Surface Water, Toxic Substances, Waste Water

Keywords: contaminant transport, drugs, pharmaceuticals, personal-care products, trace organics, wastewater, water quality

Start Date: 01/01/2003

End Date: 01/01/2004

Federal Funds: \$13799.00

Matching Funds: \$25457.00

Congressional District: 2nd

Principal Investigators: Mackay, Allison

Abstract: Pharmaceuticals and other compounds of wastewater origin have been observed throughout the US in surface waters impacted by urban activities. The presence of pharmaceuticals in aquatic environments is of concern because, even at ng/L levels, these molecules are biologically active and can affect critical development stages and endocrine systems of aquatic organisms. Current pharmaceutical fate studies have been survey-oriented, only documenting occurrence in a variety of environmental systems. Few data regarding temporal and spatial distributions, or environmental degradation rates of pharmaceuticals in surface waters have been collected. No such studies have been conducted to date in the US. The objectives of this proposed study are to monitor the temporal and spatial distributions of pharmaceutical compounds introduced to the environment from a well-defined wastewater treatment plant discharge to a river. The study will be conducted in the Pomperaug River, a tributary of the Housatonic River, located in western Connecticut near the town of Southbury. The only point source discharge of pharmaceutical compounds to this river is the Heritage Village Water Treatment Plant which serves a residential retirement community of 5000. Research tasks will include quarterly sample collection from the treatment plant influent and effluent, and at discrete locations downstream in the river channel. Observed concentrations in the river will be compared to predicted concentrations using a

conservative transport model to: (1) identify pharmaceutical compounds with potential for ecotoxicological risk in this watershed, and (2) to estimate the magnitude of sink mechanisms for unconserved compounds. Specific analytes will be chosen based upon community usage and the potential for toxicological impacts on non-target organisms. This study will expand the understanding of water quality in the Pomperaug River and complement on-going research activities in this watershed. Results of this research will include: (1) seasonal ambient concentrations of pharmaceuticals, and (2) seasonal measurements of pharmaceutical fluxes through the study reach. Concentration levels are of importance for ecotoxicologic exposure assessments. Flux measurements will be used to calculate environmental degradation rate constants, or half lives, for the non-conserved pharmaceuticals. On a broader scale, the rate observations made in this study will provide a context within which to interpret point observations of pharmaceuticals obtained in ongoing national surveys (e.g., USGS NAWQA study of Pharmaceuticals and Organic Compounds of Wastewater Origin).

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Last Modified: Wed May 28, 2003 4:26 PM

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