A Reconnaissance for Emerging Contaminants in the South Branch Potomac River, Cacapon River, and Williams River Basins, West Virginia, April-October 2004

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ABSTRACT

In 2003 a team of scientists from West Virginia Division of Natural Resources and the U. S. Geological Survey found a high incidence of an intersex condition, oocytes in the testes, among smallmouth bass (Micropterus dolomieu) in the South Branch Potomac River and the Cacapon River of West Virginia, indicating the possible presence of endocrine-disrupting compounds (EDCs). Possible sources of EDCs include municipal and domestic wastewater, and agricultural and industrial activities. Several sampling strategies were used to identify emerging contaminants, including potential EDCs, and their possible sources in these river basins and at an out-of-basin reference site. Passive water-sampling devices, which accumulate in-stream organic chemical compounds, were deployed for 40-41 days at 8 sampling sites. Sampler extracts were analyzed for a broad range of polar and non-polar organic compounds including pesticides, flame retardants, pharmaceuticals, and personal-care products. Analysis of passive-sampler extracts found 4 compounds; hexachloro-benzene; pentachloroanisole; 2,2',4,4',5-penta-bromo-diphenyl ether (BDE 47); and 2,2',4,4',6-penta-bromo-diphenyl ether (BDE 99) to be present at every sampled site, including the reference site, and several sites had detectable quantities of other compounds. No detectable quantity of any antibiotics was found in any passive-sampler extract. Effluent samples were analyzed for 39 antibiotics as tracers of human and agricultural waste. Additionally, poultry-processing plant effluent was sampled for roxarsone, an organoarsenic compound used as a poultry-feed additive, and other arsenic species as tracers of poultry waste. Antibiotics were detected in municipal wastewater, aquaculture, and poultry-processing effluent, with the highest number of antibiotics and the greatest concentrations found in municipal effluent. Arsenate was the only arsenic species detected in the poultry-processing plant effluent, at a concentration of 1.0 µg/L. Water samples were collected from 7 stream sites and analyzed for arsenic species, including roxarsone. Arsenate was detected in samples from 6 of the 7 stream samples, in concentrations ranging from 0.3 to 0.5 µg/L. Additionally, the analysis of smallmouth bass blood plasma for potential EDCs indicated the presence of several compounds including some found in the passive sampler extracts, specifically BDE 47 and BDE 99. Data from this reconnaissance will help to focus efforts for further studies of the occurrence of emerging contaminants, EDCs, and intersex in smallmouth bass in these Potomac River tributaries.

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