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Patuxent Wildlife Research Center

Perfluorinated Chemicals in Surface Waters and Sediments from Northwest Georgia, and Their Bioaccumulation in *Lumbriculus variegatus*

- ***The Challenge:*** Perfluorinated chemicals (PFCs) have been widely used for over 50 years because of their numerous properties including water, soil, and oil repellency. Many of these compounds are slow to decompose, persisting in the environment and biomagnifying through the food chain. Across the world, plants and animals (including humans) contain PFCs in their tissues due to indirect low-level environmental exposure, but exposures to much greater concentrations are occurring near point sources of contamination.

- ***The Science:*** Point sources of PFC contamination occur in relation to certain manufacturing processes including those used in the carpet and textile industries. However, little is known concerning the movement, distribution, degradation, and bioaccumulation of the various chemicals in this group. This research investigated the fate of PFCs emanating from a known source of carpet-industry wastewaters to the Coosa River watershed. Concentrations of 15 PFC homologues were measured in surface waters and sediments from locations above and below the site to examine their distribution downstream from wastewater outfalls. Collected sediments were also utilized in 28-d exposures with the aquatic oligochaete, Lumbriculus variegatus, to assess PFC bioaccumulation.

- ***The Future:*** Concentrations increased below the known source of wastewater to extremely high levels that appeared to be partially maintained downstream by additional sources. Carboxylate homologues with ten or less carbons were prominent in surface waters but those of longer chain lengths dominated sediment and tissue samples. Despite a ban 2003, perfluorooctane sulfonate (PFOS) was the major homologue in contaminated sediments followed by carboxylates containing 10 to 14 carbons. This pattern of sediment PFCs was consistent among sites and may represent the signature of wastewaters from the carpet industry, which is heavily concentrated in the area. Bioaccumulation in oligochaete tissues reflected sediment concentrations, and increased with chain length and the presence of the sulfonate moiety. PFOS and long-chain carboxylates can be expected to accumulate and magnify in fish inhabiting this river. Differences in accumulation factors indicate that short-chain carboxylates may be commercial alternatives that are more environmentally benign in aquatic ecosystems, but sulfonates with four to seven carbons may be as likely to bioaccumulate as PFOS.

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