PHARMACEUTICALS AND OTHER EMERGING CONTAMINANTS IN WATER RESOURCES OF THE UNITED STATES

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Since 1998, the U.S. Geological Survey (USGS) has been developing analytical capabilities to measure pharmaceuticals and other emerging contaminants (ECs) in a variety of environmental matrices. Currently, the USGS can analyze more than 160 ECs using a variety of LC/MS and GC/MS techniques. To date, over 500 samples from across the United States, representing a wide range of climatic and hydrologic conditions, have been analyzed for ECs. Early research focused on broad-scale reconnaissance studies, providing the first nationwide data on the occurrence of ECs in water resources of the United States. These results documented that ECs are commonly present in streams and, to a lesser extent, aquifers, particularly at sites that are immediately downstream or down gradient of contaminant sources. Some of the most frequently detected compounds included cholesterol (plant and animal steroid), DEET (insect repellent), caffeine (stimulant), triclosan (antimicrobial disinfectant), and tri(2-chloroethyl)phosphate (fire retardant). Prescription pharmaceuticals and antibiotics also have been commonly detected at ng/L concentrations. Detection of multiple ECs was common, with as many as 38 ECs being found in a single water sample. Recent research has shown that bed sediment can also act as a reservoir of pharmaceuticals and other ECs to the environment. Current and planned research is focused on determining source strength and source pathways of ECs, their fate and transport through the environment, and potential ecological health effects.