Ecological Effects of Antibiotics in Runoff from an Eastern Shore Tributary of the Chesapeake Bay

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Manure containing dietary antibiotics from approximately 82 million chickens is used to fertilize the fields in the Pocomoke River Basin. The Pocomoke River is a tributary of the Chesapeake Bay, in the Delmarva Peninsula of Maryland. Runoff from agricultural fields on which the manure is applied affects the ecology of the Pocomoke River. The altered ecology has been suggested as a contributor to outbreaks of toxic microorganisms including *Pfiesteria picicida* resulting in large fish kills and human health problems. In this paper, we describe results of screening studies of microbial populations in Pocomoke River bed sediments and from the bed sediments of a reference basin, Popes Creek, Virginia. Popes Creek is a tributary of the Potomac River that empties into the Chesapeake Bay. In addition, we propose a comprehensive study to evaluate antibiotic resistance of microbial populations from the two watersheds.

Preliminary studies have demonstrated differences in microbial populations in the two watersheds. Screening studies suggest that antibiotic resistant microorganisms are present in Pocomoke River sediments. By comparison, microorganisms from Popes Creek sediments were sensitive to the antibiotics that were tested.
We propose a collaborative study between the U.S. Geological Survey and George Mason University in which the distribution of antibiotics originating in poultry feed is determined and the effect of this distribution on the microbial communities in the two watersheds is evaluated. Water and sediment samples will be extracted and analyzed using high performance liquid chromatography with ultraviolet diode array and integrated pulsed amperometric detectors for a broad spectrum of hydrophilic and hydrophobic antibiotics often included in poultry feed. Aerobic and anaerobic microbial communities from the two watersheds will be compared with respect to sensitivity and resistance to the antibiotics found in water and sediment samples.

Data collected from this study will assist researchers in targeting and monitoring key antibiotics in tributary watersheds of the Chesapeake Bay. The data also will help to determine the environmental fate of animal antibiotics with respect to their partitioning between aqueous and solid phases. A goal of this project is to assess the effects of antibiotics on microbial activity in an environmentally sensitive watershed.

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