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SOURCE-TRACKING OF ANTIBIOTIC RESISTANT GENES IN THE SOUTH PLATTE RIVER WATERSHED OF NORTHERN COLORADO USING POLYMERASE CHAIN REACTION-SINGLE STRANDED CONFORMATION POLYMORPHISM

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ABSTRACT: Many have proposed that the natural environment has become a reservoir of antibiotic resistance as a result of urban and agricultural practices. Antibiotic resistance genes (ARG) have been found in various environmental compartments including groundwater and surface water. The ability of ARG to be transferred to other organisms, such as pathogens, suggests that the mere presence of ARG in any environment could be linked to antibiotic resistant infections that pose a threat to human health. Therefore, ARG can be viewed as emerging environmental contaminants. In this study, differences between the DNA sequences within a class of ARG found to be present in the South Platte River Basin watershed in northern Colorado were identified using the method of polymerase chain reaction-single stranded conformation polymorphism (PCR-SSCP). Water and sediment samples were collected twice during low-flow conditions and once during high-flow conditions from various sites along the Cache La Poudre and South Platte Rivers in Northern Colorado. DNA was extracted from the samples and PCR was used to verify the presence of various ARG. The PCR products were analyzed with SSCP, resulting in a particular ARG SSCP signature, or a pattern of varying gene sequences within a class of ARG, that corresponds to a site in the rivers. ARG SSCP signatures of river sites were compared to the ARG SSCP signatures of other river sites with different levels of agricultural and urban influences and to the ARG SSCP signatures of probable sources such as wastewater treatment plants, dairies, and feedlots. These comparisons can be used to determine the origins of ARG in the South Platte River Basin. Additionally, this research will make it possible to track the fate and transport of ARG in the environment and will lead to a better understanding of the risks posed by sources of ARG. Ultimately, appropriate engineering controls can be designed for the reduction of ARG for the sources that pose the greatest risk to human health.

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