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Anthropogenic Induction of Antibiotic Resistance by Sulfamethoxaozle

Antibiotics are not fully processed by the body, remaining active when excreted. Municipal water and wastewater treatment plants do not have the technology to filter antibiotics from fluids that make their way to waterways and ultimately become drinking water. In these waterways, bacteria have contact with antibiotics that either kill the microorganism, or force bacteria to develop resistance in order to survive. The objective of this study was to examine if non-resistant Escherichia coli could be forced to develop resistance when subjected to elevated concentrations of sulfamethoxazole. Concentrations were chosen to simulate those found along the Platte River to show how current environmentally relevant concentrations found in local waterways have the ability to cause non-resistant bacteria to develop resistance. To simulate sulfamethoxazole levels found in the Platte River, a 12"x 20" 'mega' plate was constructed containing five sections with varying amounts of Sulfamethoxazole—0mg/L, 162.5mg/L, and 325mg/L. Non-resistant E. coli was inoculated across the concentrations and assessed for growth for five days. From growth that occurred across the plate, 20 samples were chosen for analysis to confirm the growth was due the initial E. coli. A two-pronged approach, utilizing biochemical and molecular analysis was employed to verify that the bacterial growth on the plate was the same as the starting strain of E. coli. Results showed nearly all collected samples were the same as the initial E. coli strain, demonstrating an induction of antibiotic resistance in a previously non-resistant strain.