Wastewater Treatment Chemicals' Effect on Escherichia coli WP2 pKM101 Mutation & Antibiotic Resistance Genes

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Antibiotic resistance is a problem that has been escalating for decades. With pharmaceutical drugs becoming less and less effective, the blame is often shuffled toward the notion of antibiotics being misused and overused across the globe. While undoubtedly true, this paper delves deeper into the issue – beyond the surface – investigating whether human-released acids and chemicals for the treatment of wastewater are the real killers behind the issue. The fundamental principle is this: some chemicals (induced mutagens) are capable of causing an induced mutation of bacterial DNA, leading to more alleles becoming a part of the genome. By sheer probability, some of these alleles will be advantageous for this organism, and thus the population as a whole when the factor is introduced. These alleles are the hypothesized drivers behind antibiotic resistance. To test this theory, the Ames Mutagenicity Assay was utilized – designed to test the mutagenic potential of a chemical. A specific bacterium (WP2 PKM101) was chosen for this test and combined with independent variable chemicals – Hydrochloric and Sulfuric Acid – and monitored for a color change caused by media acidification. If a color change occurred, the bacteria mutated to survive (lacking tryptophan amino acids). Further experimentation was conducted along the lines of using tryptophan-minimum agar plates. Ultimately, the results were varied and demonstrated that there is a barrier to entry for chemicals to cause significant mutation among the population.

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