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Characterization of Microbial Populations in Landfill Leachate

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Abstract:

In the United States, municipal solid waste (MSW) landfills remain a potential mining source of recoverable materials, including but not limited to critical, precious, and rare earth metals found in electronic waste. This is possible due to collectible leachate that filters through MSW landfills, carrying metals, nutrients of value, and microbes—some of which may hold key metal bioleaching properties—within. The purpose of this study is to begin analyzing leachate from MSW landfills in the American Midwest to understand the composition of microbial communities within these landfills. Landfill leachate samples sourced in northern Indiana, representing the landfill process during unique times of operation, were used in this study. Culture-independent studies, utilizing both DNA extraction and PCR for communities of archaea, bacteria, and fungi, were performed on leachate samples. Current results indicate that in 6 of 11 samples, both bacterial and archaeal DNA were likely present, while 1 additional sample yielded only amplified archaeal DNA, and 1 more yielded only amplified bacterial DNA. This implies the presence of both archaea and bacteria which may hold metal bioleaching capabilities. Follow-up research will involve analyzing other Midwestern leachate samples, identifying landfill microbes with metal bioleaching properties, and developing a way to integrate these microbes with membrane filtration and other physico-chemical processes to improve recovery of important metals from leachate.