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Microbial recovery as a tool for copper bioremediation – can identifying native bacteria that thrive in mine environments be a key to extracting valuable metal from waste streams?

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In the transition to a green energy economy, there will be a significant increase in the demand for copper (Cu). The expected demand for Cu will outstrip estimated production from traditional sources by 9.7 million tonnes per year by 2030. Whereas mine tailings and other waste streams including mine-influenced waters contain more than 43 million tonnes of Cu which is not able to be extracted using the current available technology. Bioremediation is the process of utilizing a biological system, in this case bacteria, to remove contaminants from the environment. Furthermore, bacteria may have the potential to selectively capture metals such as Cu and even form Cu nanoparticles. If we could bridge the gap by utilizing bacteria to extract waste metals from mine tailings, this has the potential to offset the Cu gap and reduce environmental impacts from contaminated waste for a more sustainable future. Here we investigated the ability to develop a screening process to enrich and isolate native bacteria from mine tailings from two major copper mines. We first used microbiological techniques with multiple types of growth media to isolate hundreds of bacterial samples. With these samples we then developed and optimized a high throughput automation screening assay to understand the growth dynamics of these strains in the presence and absence of Cu. We have identified a number of strains of interest and are hoping to understand these further through genome sequencing (16S and whole genome) as well as microscopy and metal bioaccumulation assays.