The Surprise in the Slime: Sulfate-Reducing Bacteria and Iron-Related Bacteria in Public-Use Fountain Biofilms in Hot Springs National Park

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Unknown deposits have recently been found in the pipes of Libbey Fountain, one of the public jug fountains in Hot Springs National Park. To analyze the cause of these microbial corrosion deposits and the metabolic pathways of the prokaryotes involved, Biological Activity Reaction Test (BART) biodetectors were used to assess nine samples from five spring locations. After aseptically swabbing pipes from each site, Iron-Related Bacteria (IRB), Sulfate-Reducing Bacteria (SRB), and Slime-Forming Bacteria (SLYM) BARTs were inoculated and physical observations were recorded for each BART biodetector over nine days. Although iron was hypothesized to be the main contributing energy source in the springs, only two of nine IRB BART biodetectors reacted positively. Three SRB BART detectors reacted positively, while six SLYM BART detectors reacted positively. Because IRB and SRB BART results were both expressed in two sites, iron and sulfate-reducing metabolic pathways were occurring simultaneously. Positive SLYM BART reactions indicate the presence of biofilms, and because positive reactions were expressed without IRB or SRB BART results in some pipes, other metabolic pathways may be occurring. Furthermore, Energy Dispersive X-Ray Analysis (EDX) revealed manganese to be the main element of the unknown deposits and calcium to be the main element of the tufa rock sample. Based on these results, manganese-related microbial corrosion is also occurring in the pipes. In future research, it is important to explore different manganese bacteria as well as genetic bacterial identification to further understand these unique metabolic pathways.

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