Analysis of Microbial Diversity in PCB-Contaminated Environments

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Polychlorinated biphenyl (PCB) pollution is a global issue affecting both the environment and human health. Although industrial PCB manufacturing has been banned, PCBs remain in water, soil, and adipose tissue, resisting degradation as persistent organic pollutants. Humans can experience various harmful health effects from PCB exposure, particularly through the ingestion of affected fish. This study sought to investigate the impact of PCB-impaired waterbodies on surrounding riparian environments through analysis of microbial community diversity in sediment samples. It was hypothesized that PCB-impaired samples would demonstrate lower functional microbial diversity levels than an unimpaired sample. Sediment samples were collected from three PCB-impaired stream sites and one unimpaired site. Sample dilutions were prepared and used to inoculate Biolog EcoPlates, 96-well microplates containing 31 carbon compounds and a blank control in triplicate. A microbially-diverse sample can metabolize a greater number of compounds. Metabolization causes a redox dye to change color within the utilized wells. Optical density (OD) values were measured with a microplate reader after 46 hrs. Average well color development (AWCD), richness, Shannon evenness index, and Shannon diversity index were calculated from the ODs of each sample. The unimpaired sample demonstrated a significantly higher AWCD (t-Test, p-value=1.43E-30), richness (t-Test, p-value=7.95E-6), Shannon evenness (t-Test, p-value= 4.91E-8), and Shannon diversity (t-Test, p-value=1.24E-15) than the impaired samples demonstrated. There is less functional microbial diversity in these PCB-impaired locations, which may serve as a bioindicator of poor environmental health, raising concern for environmental impacts and health risks.

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