Hydraulic Fracturing Fluid Remediation in Water: Further Exploration of Mycoremediation Capabilities of Fungi

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Hydraulic fracturing, pumping fluids at high pressures underground to fracture shale, releases natural gas (Wiseman, 2010). Fracturing fluids resurface as flowback water. Generally disposed by containment or underground injection, fracturing fluids leach into and contaminate adjacent water sources. Fracturing chemicals can cause sensory organ irritation, and reproductive or cancerous complications (Colburn et.al, 2011). No method exists to remediate fracturing chemicals at drilling sites or from surrounding water. This research is part of an ongoing study of mycoremediation capabilities of fungi relating to fracturing chemicals. In mycoremediation, fungi decompose pollutants, rendering an environment less contaminated. For this study, 1-hexanol, toluene, octanol, octane, and 2-butoxyethanol served as model compounds. Two aqueous fracturing chemical solutions were separated into 10 containers. A pleurotus ostreatus fungi filter was placed in six containers, leaving four controls. Following exposure of the fracturing solution to the fungi filter, a sample was taken from each container and extracted three times through a solvent extraction method using ethyl acetate. The samples were injected into a Gas Chromatograph to determine chemical concentrations. Application of the fungi filter caused a 97.2% decrease in concentration of 1-hexanol and a 97.8% decrease in concentration of 2-butoxyethanol over 7 days. Following exposure to fracturing solution, the fungi filter was tested and found to remediate and metabolize 97.4% of fracturing chemicals in solution. The success of the experiment within the time frame, and evidence of metabolization of chemicals, indicates mycelium remediation of fracturing fluid is a potentially successful and sustainable solution.

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