INTRODUCTION AND BACKGROUND

The operation of shooting ranges contributes to the anthropogenic contamination of soils and groundwater by depositing unnatural quantities of metals and metalloids into the environment through the discharge of small-arms, explosive, and artillery fires. Heavy metals commonly deposited on ranges include lead, mercury, chromium, cadmium, and beryllium; these metals are toxic and have a high potential for bioaccumulation. The traditional removal of these heavy metals from the ground is both time intensive and costly, but fungal bioremediation has demonstrated a potential to isolate and uptake certain heavy metals with much less energy and overhead.

OBJECTIVE

Quantify and optimize the uptake potential of Oyster mushrooms (*Pleurotus ostreatus*) for lead, the most prevalent of metals deposited on ranges, to demonstrate the potential of Mycoremediation as a potential solution for range cleanup operations.

METHODS

- 15 different mushroom bags prepared
- 5 different samples with varying lead nitrate concentrations
  - 0, 25, 150, 450, and 700 mg lead nitrate/kg soil
  - 700 mg/kg soil is average concentration in lead ranges
- Inhibition of growth found to begin at 75 mg/kg soil
- 3 trials per sample
- Mushrooms grown from a pure spawn (akin to plant seed) in sterilized substrate with desired lead nitrate dose
- Rapid growth mixture
- Fruiting bodies dried, ground, mixed, and analyzed via Thermo Fisher X-ray fluorescent (XRF) spectrometer
- Average lead concentrations analyzed per trial and averaged by sample

LIMITATIONS

- Ideal moisture content for fungiculture is difficult to obtain without allowing natural drainage
- Soil saturation towards the bottom of grow bag inhibited propagation of spawn
- Grow bags had to be transferred to a fume hood during pinning due to their extremely powerful and pungent odor
- Ideal humidity for fruiting is difficult to maintain with constant airflow
- Secondary growth and harvest cycles (flushes) were stifled by improper humidity and moisture content

CONCLUSIONS

We found moderate evidence of growth inhibition (p-value of 0.057 from ANOVA), but the effects of this inhibition were marginal. We confirmed that *Pleurotus ostreatus* can grow in media with lead concentrations up to 700 mg/kg soil (the average concentration at shooting ranges), and that lead uptake increases proportionally to the initial concentration and can uptake 1/3rd of the lead concentration in the media on average. However, the mass of the fruiting body is marginal compared to the mass of the media required to grow it, resulting in only 1% of the total lead being uptaken in the first flush. Further study should test multiple flushes to assess the viability of sequential uptake potential and total lead that can be removed per growth cycle.

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