**Introduction**

Selenium (Se) contamination and toxicity has become more prevalent due to anthropogenic activities. Se toxicity affects animal and human health, causing neurological disturbances, bone deformations, and nervous system abnormalities. As of now, regulations exist for Se in water but there are no such regulations for Se in soil. Soils can act as a source of Se to sensitive ecosystems. Microorganisms, such as bacteria and fungi, are known to transform Se compounds, known to transform Se compounds, although their mechanisms and environmental impact are poorly understood. These organisms can reduce mobile, dissolved selenium (Se (VI), Se (IV)) into its solid, less mobile form (SeO2, Se (II)). The role of fungi in aerobic environments is particularly understudied, although their impact is likely important. Here we show experimental results of Se impacts on fungal growth in an aerobic environment.

**Objectives**

- Measure growth and tolerance of common soil fungi to selenium and observe the effects of different Se concentrations and forms (selenite vs. selenate).
- Identify species with the ability to transform selenium to less soluble forms.

**Methods**

- Use isolated cultures of six common soil fungi species: Alternaria alternata, Acremonium strictum, Paraconiothyrium sporulosum, Plectosphaerella cucumerina, Pyrenochaeta sp., and Stagonospora sp.
- Measure growth in solid and liquid AY media in varying concentrations of selenium, both selenite (Na2SeO3) and selenate (Na2SeO4): 0mM, 0.001mM, 0.01mM, 0.1mM, 0.5mM, 1mM, 10mM, and 100mM.
- Periodically assess (quantitatively and visually) fungi for approximately 30-40 days in order to determine growth rate and effect of selenium on fungi.
- Perform X-ray diffraction (XRD) analysis to determine crystallographic properties of Se nanoparticles produced by fungi.
- Conduct scanning electron microscope (SEM) analysis of liquid culture fungi showing Se(0) nanoparticles.

**Interpretations**

- Se effects both morphology and growth rate, frequently stunting or halting growth.
- A. alternata and A. strictum were most resilient to higher Se concentrations and showed greatest Se reduction.
- Four of six species showed signs of Se reduction.
- Selenite (Na2SeO3) more likely to stunt growth, selenate (Na2SeO4) more likely to stop growth; selenite is more readily reduced than selenate.
- SEM imaging suggests extracellular precipitation of Se nanoparticles.
- XRD analysis indicates either amorphous nature or small size of Se nanoparticles.

**Future Work**

- Complete SEM work on remaining three fungi species.
- Identify additional features on pictures obtained from stereo scope and SEM.
- Test different strains and species of fungi.
- Introduce more complex variables, including higher nutrient concentrations and other forms of media.
- Employ other techniques in order to determine structure of Se precipitates.
- Obtain and run similar tests on fungi species from known Se-rich environments.

**Results**

**Effects on fungal morphology**

- Fig 2 (left). A. alternata, 0mM Se.
- Fig 3 (below). A. alternata grown on AY media on 90mm pitre dishes. Image on right of each image pair shows close-up of fungal hyphae.
  - Pink color is indicator of Se reduction.
  - Gray color is pigment.

**Changes in growth rate**

- Pyrenochaeta sp.
- A. strictum
- P. cucumerina
- Stagonospora sp.
- A. alternata
- P. sporulosum

**SEM analysis**

- Fig 7. A. alternata, 0.01mM Na2SeO3. Shows transformation of nanoparticles.

**X-Ray Diffraction**

- Fig 9. Synthetic selenium.
- Fig 10. P. cucumerina 0.01mM Na2SeO3.

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**References**

