# Investigating the effects of Se on fungal growth and biomineral production

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Selenium (Se) contamination is a global environmental concern due largely to anthropogenic activities such as mining and coal combustion. Excess Se in soils and surface waters can have detrimental effects on the surrounding flora and fauna. Both biotic and abiotic factors can mediate Se redox transformations, thereby controlling Se toxicity, bioavailablity, and mobility in the environment. In aerobic environments, the influence of fungi (which often constitutes the dominant microbial biomass in soil environments) on the fate of Se is poorly studied.

The purpose of this study was to investigate the effects of Se concentration and form on fungal growth. Six common soil fungi originally isolated from metal-rich environments were grown in the laboratory over the course of one month in media containing different Se concentrations (0.00mM, 0.001mM, 0.01mM, 0.1mM) and forms (selenite [Se(IV)[ and selenate [Se(VI)]). For all species, increasing Se concentration decreased fungal growth rate (for example, 0.1mM Se(IV) reduced *Alternaria alternata* growth by roughly 50%) and growth symmetry (asymmetric growth observed as opposed to the regular radial pattern), though this was more pronounced in the presence of Se(VI) than Se(IV).

Additionally, some species of fungi (notably *Alternaria alternata* and *Acremonium strictum*) precipitated a light red biomineral, particularly at higher concentrations. Scanning electron microscopy (SEM) and X-ray diffraction showed that the biogenic precipitates were X-ray amorphous, nano-sized (50-300 nm diameter) extracellular Se particles (elemental Se [Se(0)]), formed as a result of fungally-mediated Se reduction. This study has indicated the ability of certain fungal species to reduce aqueous Se(IV) and Se(VI) under aerobic condictions, to the less bioavailable, immobile elemental Se. Currently, little is known about the role of fungi in metal redox transformations; this study helps to advance our understanding of how fungi interact with and transform Se in aerobic environments. The results from this study have applications for bioremediation strategies in areas with high concentrations of Se.