Rhizosphere microorganisms enhance Cd accumulation by the Cd-hyperaccumulating plant *Arabidopsis halleri*

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The toxic heavy metal cadmium (Cd) contaminates agricultural soils worldwide and enters the human body via food crops and smoking. The plant *Arabidopsis halleri* is considered for the use in phytoremediation of Cd-contaminated soil, as it hyperaccumulates Cd. However, little is known about the biotic and abiotic soil parameters that influence the uptake and accumulation of Cd by *A. halleri*. Soil microorganisms could impact *A. halleri*'s uptake of Cd, as microbes are known to be closely associated with plants. So far, it is not known whether soil microbes could increase bioavailability of Cd to the plant, increasing the yield of Cd accumulation, and hence, phytoremediation.

Here we show that the presence of soil microorganisms increases the uptake of Cd in *A. halleri*. In green house studies, *A. halleri* was grown on soil, which varied in the abundance and community diversity of microorganisms. The natural microbial community of the soil increased Cd accumulation in *A. halleri* by a factor of two compared to gamma-sterilized soil conditions. The plant uptake of Cd was confirmed by decreasing Cd contents in the soil. Using 454 pyrosequencing, changes in soil microbial community structure were traced and compared between microcosms using untreated and gamma-irradiated soil. This approach provided first indications, which microbial groups are potentially involved in a higher uptake of Cd by *A. halleri*.

The data presented here gives insights into the importance of a functioning microbial community for the uptake of Cd into *A. halleri*. The identification of microbial key players that increase the Cd accumulation by *A. halleri* could lead to the development and application of a microbially-assisted phytoremediation of Cd-contaminated soils.