Function of plant root border cells in the phytoremediation of soil metal contaminants.

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Abstract. The use of plants has been a target for the remediation of contaminated soils. Most plant species produce specialized cells called ‘border cells’ which are programmed to disperse from the root system into the soil environment. Like neutrophil extracellular traps (NETs) in animals, an extracellular DNA-based matrix produced by root border cells traps pathogens and toxic metals to protect the root tip from infection and injury. For example, previous studies showed that border cells of legumes trap aluminum and prevent uptake into the growing root. Subsequent studies also documented border cell extracellular trapping of arsenic, cadmium, lead, and other contaminants. Our preliminary results revealed that border cells from a single corn or cotton root can remove up to 83% of 1.0 mM lead from a 1-ml sample during a 1-hour period of incubation. However, no significant uptake of silicon from the liquid surrounding border cells has been detected. Continued study of the effects of metals on root border cells will help to understand this variation and yield insights into mechanisms and limitations of metal trapping by border cells, and thereby offer new avenues to improve the efficiency of phytoremediation.