Preliminary studies for assessment of heterogeneity of lead in soil and its implications for uptake by plants

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It has previously been shown that heterogeneity in the spatial distribution of zinc and cadmium in soil plays an important role in predicting the uptake of these metals by some accumulator plants [1,2]. This effect has implications for both improving phytoremediation of contaminated soils, and for modelling human exposure to these metals by ingestions of food crops. This research aims to ascertain whether this effect of heterogeneity is equally important for lead contamination of soils and its uptake into accumulator plants.

The preliminary research will review methods for quantifying in situ heterogeneity in soils [3] and synthesis previous estimates of the heterogeneity of lead at sites contaminated by a range of activities, such as mining, smelting, landfill and firing ranges. This will be supplemented by fresh measurements of lead heterogeneity over a range of scales (0.001-150m), using techniques such as portable XRF, at heavily contaminated lead mining sites in Derbyshire.

Selections of a suitable accumulator plant will be based upon criteria such as its bioaccumulation factor (from soil to plant), translocation factor (from roots to shoots) and the size of the root ball compared with the appropriate scale of the heterogeneity [4]. Plant species being considered will include, Brassica juncea, *Bidens alba, Helianthus annus, Thlaspi caerulenscens, Gentianna penneliana and Chromolaena odorata*.

Conclusions will be drawn as to the optimal experimental approach in terms of quantifying in situ heterogeneity, how heterogeneity is related to the source of lead pollution, and the most appropriate accumulator plant to investigate the effects of heterogeneity on uptake, supported by initial experimental results.

References

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