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# Health risk assessment in farmlands contaminated by metallic mining activity under calcareous context and Mediterranean climate

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## Abstract

The farmlands surrounding the ancient mine site of Jebel Ressas (Tunisia) have been contaminated for decades mainly due to the hydric and eolian erosion of mining waste dumps left without environment protection measures. The metal contamination of agricultural soils and crops was studied to evaluate the local population health risk. The results show the soil Cd and Pb contamination over an area of 180 hectares and up to 5 km distance from the dumps. The toxic metals contents in soil reach 231 and 20 100 mg.kg<sup>-1</sup> for Cd and Pb respectively, but decrease with the distance from the dumps down to 0.2 and 35 mg.kg<sup>-1</sup> for Cd and Pb respectively. Analyses of 12 local edible fruits and vegetables such as dates, prickly pears, olive fruits and mallow leaves indicate that, although a low solubility of metals could be expected within the calcareous soils of this area, metals appear to be absorbed by these plants. High contents in parsley and mallow were recorded, reaching up to 4 times the allowable EC limits for Cd, and 26 times for Pb in leafy vegetables. Local population exposure to metals by both soil ingestion and consumption of contaminated plants has been estimated and the health risk has been confirmed for farmlands inhabitants, especially for children. The contribution to risk of locally grown plant consumption is higher than soil dust ingestion due to a low bioaccessibility of metal in carbonated soils. Hence, carbonated context acts as a natural protection when soil dust is ingested, but it does not prevent plants to accumulate metals as, depending on species, the active strategies developed by plants for nutrient absorption also induce solubilization and adsorption of metals. Soil dust contribution to health risk is at the most 3.4 % for adults and at the most 13.1 % for children.

**Keywords:** Cadmium, Lead, Ingestion pathway, mineral speciation, bioaccessibility

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