Ants and their nests as indicators for industrial heavy metal contamination.

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Abstract: Ants accumulate heavy metals and respond to pollution with modification in species composition, community structure, altered behaviour and immunity. However, the levels of heavy metals in ants' nests and explicit individual-level responses towards heavy metals have not been revealed. We found that red wood ants Formica lugubris accumulate high and correlated values of such heavy metals as Al, Cd, Co, Cu, Fe, Ni, Pb and Zn both in ants and nest material near cobalt smelter in Finland. Relative differences in metal concentrations were higher in nests than in ants. The highest values were obtained for elements such as Co (36.6), Zn (14.9), Cd (9.7), Pb (8.5), Cu (7.4), Ni (6.4), As (4.7), Cr (2.9) and Fe (2.4) in nest material, and Co (32.7), Cd (6.3), Pb (6), Fe (2.8), Ni (2.9) and Zn (2.1) in ants. In industrial and reference areas, ants have no differences in size, but differed in dry and residual body mass. In polluted areas, F. lugubris had less melanised heads, but not thoraxes. The sensitivity of cuticular colouration in red wood ants subjected to heavy metal pollution might be related to metal-binding properties of melanins. The overall results are useful for the improvement of biomonitoring techniques using ants as indicators of industrial contamination and for further discovery of novel ecotoxicological biomarkers.

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