



Soil pH effects on the comparative toxicity of dissolved zinc, non-nano and nano ZnO to the earthworm *Eisenia fetida*

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Abstract

To determine how soil properties influence nanoparticle (NP) fate, bioavailability and toxicity, this study compared the toxicity of nano zinc oxide (ZnO NPs), non-nano ZnO and ionic ZnCl₂ to the earthworm *Eisenia fetida* in a natural soil at three pH levels. NP characterisation indicated that reaction with the soil media greatly controls ZnO properties. Three main conclusions were drawn. First that Zn toxicity, especially for reproduction, was influenced by pH for all Zn forms. This can be linked to the influence of pH on Zn dissolution. Secondly, that ZnO fate, toxicity and bioaccumulation were similar (including relationships with pH) for both ZnO forms, indicating the absence of NP-specific effects. Finally, earthworm Zn concentrations were higher in worms exposed to ZnO compared to ZnCl₂, despite the greater toxicity of the ionic form. This observation suggests the importance of considering the relationship between uptake and toxicity in nanotoxicology studies.

Reference

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