

# Nano copper oxide is a threat to an endemic shredder of the Iberian Peninsula

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The increased usage of nano metal-based products enhances the possibility of its release into freshwater ecosystems and this may put aquatic biota and ecological processes at risk. Invertebrate shredders mostly use leaf litter as a food resource and play a key role in the energy and nutrient transfer in aquatic detritus foodwebs. In this study, we assessed the sublethal toxicity of nano CuO on the growth and feeding behaviour of larvae of the shredder *Allogamus ligonifer* (Trichoptera, Limnephilidae), an endemic species in streams of the Iberian Peninsula. The experiment was carried out in glass containers with sterile stream water, each housing a larva (15 replicates). The invertebrates were allowed to feed for 10 days on microbially colonized alder leaves according to the following treatments: (1) leaves previously treated for 5 days with 25 or 75 mg L<sup>-1</sup> nano CuO and stream water, (2) untreated leaves and stream water with 25 or 75 mg L<sup>-1</sup> nano CuO, and (3) untreated leaves and untreated stream water (control). The experiment was replicated in the absence of invertebrates to discriminate the contribution of microbes to leaf litter decomposition. Microbes contributed with 34% to total leaf mass loss in control, and microbial decomposition decreased with the increase of nano CuO concentration. Leaf consumption rate by the invertebrate was 0.27 mg leaf DM day<sup>-1</sup> mg<sup>-1</sup> animal DM. The highest inhibition of leaf consumption (47%) was found in the treatment in which the animals were exposed to water with 75 mg L<sup>-1</sup> nano CuO, followed by the treatment in which the animals were fed on leaves previously exposed to 75 mg L<sup>-1</sup> nano CuO (24%). A similar response pattern was found for the growth rate of invertebrates when exposed to nano CuO via stream water or leaves (56 in control vs 30 and 41 µg individual DM mg<sup>-1</sup> individual DM day<sup>-1</sup> in treatments). Results will be interpreted based on the adsorption and accumulation of nano and/or ionic copper in invertebrates (body and case) and leaves.

Keywords: Nano CuO, invertebrate shredder, feeding activity, streams.

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