

**Topical Scientific Workshop on Risk Assessment for
the Sediment Compartment**
7-8 May 2013, Helsinki, Finland

CASE STUDY – SUMMARY FORM

6

(Number to be filled by the organisers)

The case studies covering concrete examples of sediment risk assessments for particular chemicals and/or conditions are intended to support the breakout group discussions. All submitted case studies will be distributed to the participants as supporting background material for the workshop and will be included in the workshop proceedings. The Scientific Committee will select some case studies or selected areas of the case studies and will invite the authors to present these cases during the workshop, either at the plenary session or during the break-out groups.

NOTE: By submitting this form, the authors confirm that they have the ownership of the information presented in the case study and that they authorise ECHA to distribute the submitted information to the workshop participants and to publish it in paper and/or electronic format as part of the workshop proceedings.

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Case study details

Case study is particularly relevant for the subthemes:

Note: the case study should cover all three areas, but please indicate if it is particularly relevant/informative for one or more subthemes

- | | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Problem definition and conceptual model for sediment risk assessment |
| <input checked="" type="checkbox"/> | Exposure assessment |
| <input type="checkbox"/> | Effect assessment |

Authors: Lerner F, Dogra, Y, Tyler CR, Dybowska A, Fabrega J, Stolpe B, Bridgestock L, Goodhead R, Weiss D, Moger M, Lead j, Valsami-Jones E, Rehkamper M and **Galloway TS**

Title: Tracing Bioavailability of ZnO Nanoparticles Using Stable Isotope Labeling

Keywords: sediment toxicology, risk assessment, zinc oxide nanoparticles, *Corophium volutator*, crustacean, mesocosm

Summary: Zinc oxide nanoparticles (ZnO NPs) are widely used in commercial products and knowledge of their environmental fate is a priority for ecological protection. In this case study we synthesized model ZnO NPs that were made from and thus labeled with the stable isotope ^{68}Zn and this enables highly sensitive and selective detection of labeled components against high natural Zn background levels.

We combined high precision stable isotope measurements and novel bio-imaging techniques to characterize parallel water-borne exposures of the common mudshrimp *Corophium volutator* to ^{68}ZnO NPs, bulk ^{68}ZnO , and soluble $^{68}\text{ZnCl}_2$ in the presence of sediment. *C. volutator* is an important component of coastal ecosystems where river-borne NPs will accumulate and is used on a routine basis for toxicity assessments.

Our results demonstrate that ionic Zn from ZnO NPs is bioavailable to *C. volutator* and that Zn uptake is active. Bioavailability appears to be governed primarily by the dissolved Zn content of the water, whereby Zn uptake occurs via the aqueous phase and/or the ingestion of sediment particles with adsorbed Zn from dissolution of ZnO particles. The high sorption capacity of sediments for Zn thus enhances the potential for trophic transfer of Zn derived from readily soluble ZnO NPs.

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The uncertainties of our isotopic data are too large, however, to conclusively rule out any additional direct uptake route of ZnO NPs by *C. volutator*

These results have been published in Environmental Science and Technology 2013 **2012**, 46 (21), pp 12137–12145 **DOI: 10.1021/es302602j**

Additional available information on this model system is presented in the attached paper (Annex 1) and supporting information (Annex 2):

Fabrega, J., Tantra, R., Amer, A., Stolpe, B., Tomkins, B., Fry, R., Lead, J., Tyler, C. and **Galloway, T. S.** (2011) Sequestration of zinc from zinc oxide nanoparticles and life cycle effects to the sediment dwelling marine amphipod *Corophium volutator*. *Environ Sci. Technol.* 46 (2):1128–1135

Link to scientific paper and supporting information:

<http://pubs.acs.org/doi/abs/10.1021/es202570g>

Poster exhibition

The case study will be presented also as a poster

Yes

No