

Uptake and toxicity of hexafluoroarsenate in aquatic organisms

Birgit Daus¹, Holger Weiss¹, Rolf Altenburger²

UFZ - Helmholtz Centre for Environmental Research, Departments ¹Groundwater Remediation and ²Bioanalytical Ecotoxicology, Permoserstrasse 15; 04318 Leipzig, Germany, birgit.daus@ufz.de

The arsenic species hexafluoroarsenate has been described as a surface water contaminant of anthropogenic origin. A method for species analysis of this compound was developed using ion pair chromatography coupled with ICP-MS [1].

Data about the ecotoxicological effects of hexafluoroarsenate are lacking in the literature. Taking into account its use as pesticide, it can be expected to show some bioactive potential. The objective of this study therefore was to characterize the eco-toxicological effects of hexafluoroarsenate with respect to aquatic organisms. Next to performing a screening of bioactivity against standard sentinel organisms (an algal one generation reproduction assay using *Scenedesmus vacuolatus*, determination of luminescence inhibition in the bacterium *Vibrio fischeri*, disturbance of *Daphnia magna* motility, and effect determination on *Danio rerio* egg development), we were interested to study the uptake of hexafluoroarsenate and understand its ecotoxicologically relevant properties in comparison to arsenite or arsenate. In particular, possible biotransformation by species analysis and investigation on the mode of action are of interest to conclude about possible detoxification mechanisms and to assess the ecotoxicological potential of hexafluoroarsenate [2].

The observed effects were evoked at high ambient concentrations and thus the ecotoxic potential was found to be low in comparison to other arsenic compounds. The most sensitive organism was the unicellular green alga *Scenedesmus vacuolatus* with an EC₅₀ value of 1.15 mmol L⁻¹ (86 mg L⁻¹ As). Nevertheless, the internal dose was of interest to evaluate the effect mechanism. A linear relationship between ambient and internal concentration was found for this organism with a slope of 1.63 μmol mmol⁻¹. The uptake seems to be limited. However, the internal concentration which shows a significant effect, e.g. 20 % of inhibition of reproduction, was found to occur at a low internal dose of 0.98 μmol L⁻¹ (73.5 μg L⁻¹ As).

Using arsenic speciation analysis with HPLC-ICP-MS, now other arsenic species were detected inside the algae. Consequently, no biotransformation takes place by the algae.

References:

- [1] Daus, B., Tümping, W. v., Wennrich, R., Weiss, H., 2007. Removal of hexafluoroarsenate from waters. *Chemosphere* 68, 253 – 258
- [2] Daus, B., Weiss, H., Altenburger, R. (2009): Uptake and toxicity of hexafluoroarsenate in aquatic organisms. *Chemosphere*, submitted