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Probing-out the formation of mercury nanoparticles by phytoplankton

LORENZ K. GFELLER, PHD[1], ISABELLE A.M. WORMS[2], VERA SLAVEYKOVA[2] AND XING ZHANG[3]

[1]TOFWERK AG
[2]University of Geneva
[3]Northwest University

Although poorly considered in the past, recent reports highlight the role of phytoplankton in aquatic mercury geo-cycling [1]. For instance, inorganic mercury (iHg) can be sequestered by phytoplankton by complexation with small ligands or by mineralization [2] , among other reactions (e.g. demethylation, reduction) which participate in the biotransformation of Hg species in freshwater settings. Recent advances in nano-characterization, notably by using hyphenated size-separation techniques to ICP-MS and ICP-MS functioning in single-particle mode, also revealed the dynamic of mineralization of iHg into small nano-particulate forms (nHg) [3]. The present study specifically focused on the uptake of iHg followed over 4 days and the proportion of bio-transformed Hg into nanoparticles by the diatom *Cyclotella meneghiniana*. Three different fractions were considered: extracellular, adsorbed and internalized fraction of Hg. The results obtained by sp-ICP-MS proven the predominance of nHg adsorbed onto the cells, which increased in proportion according to the time of Hg exposure. To better define the elemental composition of nHg, AF4-ICP-MS, sp-ICP-TOFMS and STEM-EDX analysis were performed. The output obtained from this in-depth multi-technique approach will be discussed based on the advantages and disadvantages of each of the methods used, and their helpful combination.

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