

## Oral Presentations: Session 2

### [OP 2.1]

#### Hg Methylation Potential in Aquatic Macrophytes and Periphyton of the Everglades Nutrient Removal Area, Florida (USA)

J.B.N. Mauro<sup>(1)</sup>, H. Hintelmann<sup>(2)</sup>, L. Haack<sup>(2)</sup>, J.R.D. Guimarães<sup>(1)</sup> and C. J. Watras<sup>(3)</sup>

<sup>1</sup>Laboratório de Radioisótopos Eduardo Penna-Franca; IBCCF; Bloco G/CCS/Ilha do Fundão; UFRJ; CEP: 21949-900; Rio de Janeiro (RJ)/Brasil; email: jane @biof.ufrj.br

<sup>2</sup>Trent University, Department of Chemistry, PO Box 4800, Peterborough ON K9J 7B8, Canada.

<sup>3</sup>Environmental Contaminants Section, Wisconsin Department of Natural Resources, UW Trout Lake Station, 10810 CTY N, Boulder Jct, WI 54512, USA

Wetlands are complex ecosystems comprising a mosaic of water, substrate and biota that provide a unique and dynamic interface between its elements, producing a variety of habitats. High methylmercury formation and bioaccumulation has been observed in temperate/boreal and tropical wetlands. Mercury methylation studies carried out in different tropical Brazilian wetlands showed that the methylmercury formation is considerably higher in the roots of aquatic macrophytes than in surface sediments. The average net methylmercury production observed in several studies was one order of magnitude higher in living or decomposing roots of floating or rooted macrophyte mats than in the surface of underlying lake sediments and floodplain soils. The mercury is methylated by the periphytic community adhered to the roots, which are a suitable microenvironment for an abundant microorganism growth. Therefore, this compartment may be considered as a relevant mercury methylation site in wetlands.

The biota from the Florida Everglades presents elevated methylmercury levels and restrictions to fish consumption have been imposed in this region. The mercury methylation potential in the large local aquatic macrophyte community of the Everglades has not been investigated so far, despite its importance as a key link for the nutrient cycling and for the food chain. This work investigated the mercury methylation potentials in four aquatic macrophyte species and in cultivated periphyton of the Everglades Nutrient Removal (ENR) Area (Florida/USA).

Mercury methylation was studied in four species of floating (*Salvinia rotundifolia*, *Eichhornia crassipes* and *Pistia stratiotes*) and submersed (*Ceratophyllum demersum*) aquatic macrophytes and in cultivated calcareous microalgae (periphyton) of the ENR. Plants were manually obtained and roots or shoots (for *C. demersum*) were cut in about 4 cm pieces and gently homogenized. Samples of 7.0 g w.w. in 30 mL of filtered water samples were incubated in the dark for 24 h at 30°C with <sup>203</sup>HgCl<sub>2</sub> addition (650 ng Hg.L<sup>-1</sup>). For *S. rotundifolia* the incubation was made with 3.5 g w.w. The periphyton was also incubated under light with a 12 h photoperiod. Incubations were interrupted with 1 mL of HCl (4 N) and after addition of 4 mL NaBr (3 M) and 1 mL Cu<sub>2</sub>SO<sub>4</sub> (0.5 M) the Me<sup>203</sup>Hg produced was extracted in toluene. Na<sub>2</sub>SO<sub>4</sub> was added to remove any possible trace of water, and the samples were measured by beta counting. Parallel incubations were made with <sup>200</sup>HgCl<sub>2</sub> and CH<sub>3</sub><sup>199</sup>HgCl under the same conditions. After the interruption of the stable isotope incubations, NaBr and Cu<sub>2</sub>SO<sub>4</sub> were added, the supernatant was removed and kept at 4°C until the analysis. Methylmercury was extracted by distillation, which was followed by ethylation, purge and trap preconcentration on Tenax, thermodesorption, separation by isothermal gas chromatography and detection by ICP-MS. Methylmercury formation observed for the radiolabelled Hg addition was high, confirming results from previous studies in other tropical areas, and ranged from 8 to 17% for the macrophytes (*S. rotundifolia* and *C. demersum*, respectively). Results obtained with the stable isotopes addition were also high, ranging from 1.5 to 7.7%, but approximately 2.5 times lower than those observed for <sup>203</sup>Hg addition. This might be explained by the time elapsed between the end of the incubation and the analysis (3 months). Hg(II) incubated with periphyton was methylated at a lower rate under dark (1.6% with <sup>203</sup>Hg addition and 0.1% with stable isotopes addition) and light (0.2%) conditions. The lowest levels obtained for the illuminated conditions may be explained by photodemethylation or by the stimulation of the autotrophic organisms, increasing the oxygen production and hence reducing the growth of anaerobes like sulfate reducing bacteria. Between 5 and 20% (*S. rotundifolia* and *C. demersum*, respectively) of the added Me<sup>199</sup>Hg was degraded during the 24 h incubation period. In incubations with periphyton no loss of methylmercury was observed.

In conclusion, it was observed that macrophytes have a high potential for methylating inorganic Hg. This process might contribute significantly to the high methylmercury levels observed in the Everglades biota.

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