

Microbial and Geochemical Controls on Trace Metal Mobilization in Sediments

**ISLEM MOKRANE¹, NATHALIE GASSAMA¹, CÉCILE
GROSBOIS¹, EMILIE CAMIADE², LYDIE NADAL
DESBARATS³, JÉRÉMY MONTEIRO⁴, FREDERIC
MONTIGNY⁴, YVES LE VERN⁵ AND JULIEN PICHON⁵**

¹University of Tours

²Université de Tours-UMR 1282 - Infectiologie et Santé
Publique Equipe Bactéries et Risque Materno-Foetal

³Université de Tours, INSERM, Imaging Brain &
Neuropsychiatry iBrain U1253 & Plateforme de Métabolomique
et d'Analyses Chimiques, US-61 ASB

⁴Plateforme de Métabolomique et d'Analyses Chimiques, US-61
ASB, Université de Tours, CHRU Tours, Inserm

⁵INRAE, Université de Tours, ISP

Sediments are important reservoirs for various contaminants, both organic and inorganic, including trace metals. They also contain nutrients and organic matter and host microbial communities that play a crucial role in biogeochemical transformations within aquatic systems. Despite their importance, the interplay between geochemical conditions and microbial community activity in controlling trace metal mobilization remains poorly understood.

This study explores the combined influence of microbial dynamics and geochemical conditions on the release of trace metals into the water column. Controlled leaching experiments were conducted under aerobic and anaerobic conditions, at two temperatures (12°C and 20°C), and with contrasting light regimes (light versus dark). The mobility of dissolved trace metals, major anions, phosphates, and dissolved organic carbon was assessed, and microbial activity was monitored by metabolomics and flow cytometry.

Preliminary results reveal that the activity of microbial communities under several environmental conditions significantly influences the mobilization of trace metals, with distinct release patterns, especially between oxic and anoxic conditions. Moreover, for most of the trace metals released during leaching, concentrations measured surpass the INERIS thresholds for aquatic systems, highlighting potential environmental risks. Ongoing analyses focus on the temporal evolution of microbial communities and their role in organic matter transformation and metal solubilization.

These findings underscore the complex coupling between microbial and geochemical processes in the release dynamics of trace metals into the water column, highlighting the importance of integrated approaches for understanding metal mobilization in aquatic environments and so contamination hazard.