Impact of anaerobic bacterial activities on the dynamic and speciation of mercury in tropical soils in French Guiana

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Mercury (Hg) is one of the most toxic heavy metals. Its dynamic and speciation represent a major environmental and health preoccupation. French Guyanese soils contain high concentrations of Hg due to biogeochemical background, and anthropic activities, especially gold-mining. Several studies demonstrated that in soils and under anaerobic conditions, the mobility of heavy metals was correlated to dissolution of iron oxyhydroxides and the degradation of organic matter, there is a lack of information about the importance of these processes on the mobility of Hg. Little is available too about the role of anaerobic bacteria on the Hg solubilisation and its methylation in soils. In this context our study evaluates, for the first time, the respective role of major Hg methylating bacteria such as sulfate-reducing bacteria (SRB) and iron-reducing bacteria (IRB) in soils. Moreover our study aimed to describe the relationship between energetic processes developed by anaerobic bacteria (fermentation/anerobic respiration) and Hg methylation.

To reach our goals, samples of oxisol (well drained) and gleysol (hydromorphic soil) originating from French Guyana were incubated in batch reactor under standard anaerobic conditions. Different carbon sources were respectively added in order to promote different energetic metabolisms (fermentation or anaerobic respiration). Moreover, inhibitors or stimulators of SRB or IRB were used to promote one of both microbial guilds.

First results showed that Hg methylation could take place in oxisol *in situ* under temporary anaerobic conditions which could occur after heavy rain for example. The highest global bacterial activity and iron reduction were observed in microcosms containing a fermentable carbon source (glucose), but little monomethylmercury was detected. However the Hg methylation was higher in microcosms containing acetate or lactate which promote anaerobic respiratory metabolism. Ongoing molecular analyses and using SRB/IRB inhibitors could define bacterial groups present in the studied soils and their respective role in Hg mobilisation and methylation.