

Interactions of inorganic mercury with microbial mats formed acidic hot spring

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Introduction

Hot springs may contain elevated mercury (Hg) derived from reductive dissolution of subsurface crust-bearing minerals that surfaces as gaseous and dissolved Hg(0) [1]. While Hg(0) rapidly vents to the atmosphere, there is indirect evidence suggesting active oxidation of Hg(0) to the more toxic Hg(II) form within these systems[2,3]. To better understand the fate of Hg in sulfidic geothermal systems, we investigated the interactions between inorganic Hg and precipitated solid phases supporting active microbial communities from Beowulf Spring (zone 12; easting 522855, northing 4953165), an acidic hot spring in Yellowstone National Park (YNP), USA.

Materials and Methods

Samples of precipitated sulfur and iron were collected from the sulfide and iron oxidation zones of the spring and incubated in the laboratory with radioactive ²⁰³Hg(0) or ²⁰³HgCl₂ in filtered site water at in-situ temperatures. The filtration or centrifugation was determined by liquid amount of ²⁰³Hg bound to the solid phase recovered by scintillation counting.

Results and Discussion

Precipitated solids of sulfur and iron bound significantly more Hg(II) than Hg(0) ($p=0.0017$ to 0.04), indicating that microorganisms associated with the solids are more likely to encounter the toxic and bioavailable Hg(II) as a result of Hg(0) oxidation, through photochemical reactions [4] facilitating Hg biogeochemical cycling in the spring.

	S oxidation zone (ng Hg/mg precipitate)		Fe oxidation zone (ng Hg/mg precipitate)	
	Hg(0)	Hg(II)	Hg(0)	Hg(II)
Fil	0.1±0.0	6.2±1.1	0.23±0.06	4.6±2.5
Cen	0.04±0.01	2.9±0.0	0.55±0.56	2.1±0.5

Table1: Hg bound to precipitated solids from different zones in the spring. Fil=filtered samples; Cen=centrifuged samples.

[1] Vaerkamp & Busck (1984) *GCA* **48**, 177-185 [2] Wang *et al*, (2011), *Microb-Ecol.* **62**, 732-752 [3] Boyd *et al* (2009) *Environ. Microbiol.* **11**, 950-959 [4] Lalonde *et al*, (2001) *ES&T* **35**, 1367-1372