

Monomethylmercury in Coastal Redwoods of California

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Coastal redwoods of California have been dependent over the millennia on summer coastal fog to provide one third of their annual water. Fog water intake is primarily through the stoma of the needles but fog through fall water also contributes to water uptake in the summer dry season. Coastal fog contains elevated concentrations of monomethylmercury, up to 9.8 ng/L (MMeHg) [1]. In order to assess whether MMeHg introduced by fog is concentrated in the redwood ecosystem, mercury (Hg) and MMeHg was measured in redwood needles, litter, and soil from old growth redwoods throughout their distribution along the CA coast. High concentrations of MMeHg occur in living redwood needles: from 1.6 to 3.76 ng/g (dry weight basis, dwb) about 2 orders of magnitude higher than in evergreen needles not receiving coastal fog water. Hg concentrations in living redwood needles ranges from 21.7 to 80.5 ng/g (dwb), comparable to reported values for evergreen needles in non-coastal trees. After 3 years redwood needles die and samples of brown recently deceased needles contain comparable concentrations of MMeHg and Hg to that in living needles from the same old growth redwoods. Waters and sediment under both low and high flow conditions were sampled from watersheds in old growth redwoods forests to assess levels of MMeHg. Stream waters under low flow conditions have very low concentrations of MMeHg, .02 ng/L, and under high flow conditions low MMeHg concentrations are comparable to that in rainwater, 0.19 ng/L. However Hg concentrations under high flow conditions are elevated, 22 ng/L, compared to low flow conditions where Hg concentrations range from 1.3-3.15 ng/L and Hg concentrations in rainwater, 5.4 ng/L. MMeHg concentration in stream waters are not elevated because MMeHg is retained in the redwood needles. Hg concentrations in high flow stream waters are elevated because soils developed under old growth redwoods have elevated concentrations of Hg that results from decomposition of redwood needles and transformation of MMeHg to Hg bearing phases.

[1] Weiss-Penzias *et al* (2012) *Geophys Res Letters*, **39**, L03804, 1-5.