

Biogeochemical cycling of mercury from artisanal and small-scale gold mining in Madre de Dios, Peru

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Artisanal and small-scale gold mining (ASGM) represents the largest global release of mercury to the environment and is largely unregulated throughout the world. The Madre de Dios (MDD) watershed, located in Peru's tropical Amazon, is one of the world's most biodiverse ecosystems and home to more than 150,000 Indigenous and non-Indigenous people, 40% of whom live in poverty. ASGM is widespread in MDD due to increasing global demand for gold. This research is part of an extensive environmental and human health survey in MDD to examine the impacts of mercury on communities near gold mining. Sediment and fish tissue samples were collected along a 550 km stretch of the MDD River and its headwaters, including major tributaries and areas more than 150 km downstream of mining activity. Total mercury in sediment, suspended solids, and fish increased along the MDD River. In sediment and suspended solids, mercury concentrations were not strongly influenced by tributaries draining large mining areas, suggesting a diffuse source of mercury. Fish mercury presented a major public health risk, exceeding international standards in 38% of carnivorous fish. In conjunction with environmental sampling, hair samples were collected from residents near each river sampling location. These results were compared to fish analyses to gauge the impact of mercury on MDD communities, particularly in relation to emerging infectious diseases, anemia, malaria and dengue. Future work will evaluate methylation potential in river sediments affected by ASGM and the effect of selenium on mercury bioavailability.