Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5882

Heavy metal incorporation into benthic foraminifera – A culturing study

SARINA SCHMIDT, ED HATHORNE AND JOACHIM SCHÖNFELD

GEOMAR Helmholtz Centre for Ocean Research

Presenting Author: sschmidt@geomar.de

Heavy metal pollution from anthropogenic sources increasingly influence marine environments and biota because of their toxicity, persistence and bioaccumulation. Especially coastal environments act as natural catchments for anthropogenic pollutants because these areas are highly affected by industry, agriculture and urban sewage runoff. In nearly all natural environments that are harmed by heavy metal pollution, a combination of several pollutants occurs at the same time.

In marginal seas and coastal areas, benthic foraminifera are common in meiofaunal associations, and they can be used as biomonitoring tool for changes in environmental parameters like temperature, salinity, or redox conditions. Furthermore, foraminifera take up heavy metals from the seawater and incorporate those into their carbonate shells during calcification. Moreover, foraminifera have a short life cycle and can therefore react immediately to contaminations of the environment.

Here, we will present results from culturing studies with *Ammonia aomoriensis*, *Elphidium excavatum* and *Ammonia batava* addressing the relationship of heavy metal concentration in the seawater and in the foraminiferal tests. The partitioning factor between the ambient seawater and the calcium carbonate of the foraminifera is constrained by continuous water monitoring and laser ablation ICP – MS measurements on single chambers grown during the experiment in a manipulated culturing medium. The foraminifera were exposed to a combination of ten different heavy metals over a range of concentrations comparable to current conditions in medium to high-polluted areas. A correlation between the heavy metal concentration in the culture medium and in the foraminiferal calcite was recognised for several heavy metals (e.g. Cd, Cr, Pb). Once the carbonate/seawater metal partitioning coefficients are constrained with certainty, investigations of the chemistry of benthic foraminiferal shells offer an advanced and reliable method to monitor short-term changes in the concentrations and bioavailability of toxic elements in seawater.