

## **Arsenic concentrations and species in three hydrothermal vent worms**

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Hydrothermal vent fluids are enriched in trace elements including arsenic. Arsenic concentrations and species are reported for three deep sea hydrothermal vent polychaetes (*Ridgeia piscesae*, *Paralvinella sulfincola* and *Paralvinella palmiformis*) from the Juan de Fuca Ridge in the Northwest Pacific. *R. piscesae* has similar arsenic concentrations (3.8-35  $\mu\text{g g}^{-1}$ ) to shallow water polychaetes while *P. sulfincola* and *P. palmiformis* have significantly higher arsenic concentrations (420-1417 and 125-321  $\mu\text{g g}^{-1}$  respectively). *R. piscesae* contains appreciable quantities of inorganic arsenic (14-36%), monomethyl arsenic (2-2%) and dimethyl arsenic (20-34%), which suggests that host and symbionts are either involved in the methylation of Arsenic, or are bathed in fluids enriched in methylated Arsenic as a result of free-living microbial activity. 95-98% of the arsenic in *P. sulfincola* and *P. palmiformis* is inorganic arsenic, likely the result of metal precipitation within and upon the mucus they ingest while feeding. While all polychaetes have oxo- and thio arsenosugars (2-30%), *Paralvinella* also have small amounts of arsenobetaine. The presence of arsenosugars, arsenobetaine and other minor arsenic species in the absence of photosynthesising algae/bacteria suggests that they may be formed by vent animals in the absence of sunlight, but at this time their formation cannot be explained.