Uppsala Universitet
Diversity and Evolution of Microbial Eukaryotes
Amanda Adam Jansson
2022-11-27

A taste of silver

Bacillariophyta playing an important role in biogeochemical cycling of silver

Diatoms, or Bacillariophytes, are common protists in both aquatic and terrestrial environments (Mann *et al.* 2017). In marine and freshwater systems Bacillariophyta are primary producers, estimated to account for up to 50% of marine plankton biomass. Not only do they play an important role in the carbon cycle, their involvement in recycling several other nutrients and metals is highly important. Because of diatoms ability to absorb compounds such as silver, Ag, it has been theorised that measuring silver, or other compounds, concentration in water could proxy diatom production or biomass (Barriada *et al.* 2007).

Wagner *et al* investigated absorbed silver in Bacillariophyta by analysing silver distribution in *Thalassiosira pseudonana* (Wagner *et al.* 2022). Mapping with synchrotron micro-XRF microprobes showed silver being accumulated in the cytoplasm of the cell. Silver seems to either remain freely in the cytoplasm or be compartmentalised in vacuoles, presumably to reduce toxicity. Earlier it was theorised that silver was integrated in the frustule; this study argues against it.

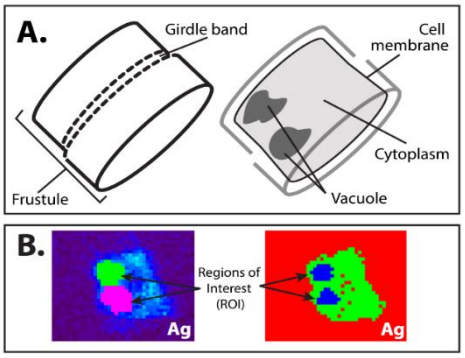

Figure 1. Structure of *Thalassiosira pseudonana* and the result of mapping distribution of Ag in the cell (Wagner *et al.* 2022).

The ability to store high silver concentrations suggests Bacillariophytes play an important role in the recycling of silver (Wagner *et al.* 2022). When the cell dies, tightly bound silver will be buried in sediments with the remaining organic matter. However, scavenging on decaying cells will release silver before sedimentation occurs. Bacillariophytes therefore contribute to both sedimentation and transportation of silver throughout the water column.

This study sheds new light on the biogeochemical cycles of our oceans and functions of one important primary producer (Wagner *et al.* 2022). Understanding the uptake and storage of silver will also give the opportunity of having accurate qualitative measurements of Bacillariophytes export production. Measurements of silver concentration in sediments may also proxy the amount of benthic productivity. However, the subject needs more research to completely understand the relationships in question.

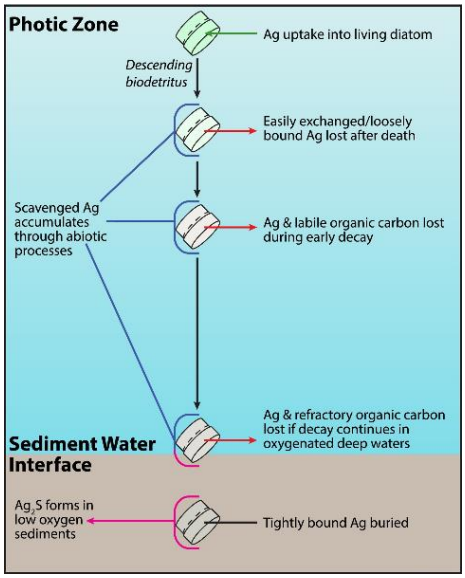

Figure 2. The pathway of diatom mediated transport of silver throughout the water column (Wagner *et al.* 2022).

UPPSALA UNIVERSITET

Uppsala Universitet
Diversity and Evolution of Microbial Eukaryotes
Amanda Adam Jansson
2022-11-27

Sources:

Barriada JL, Tappin AD, Evans EH, Achterberg EP. 2007. Dissolved silver measurements in seawater. TrAC Trends in Analytical Chemistry 26: 809–817.

Mann DG, Crawford RM, Round FE. 2017. Bacillariophyta. I: Archibald JM, Simpson AGB, Slamovits CH (red.). Handbook of the Protists, s. 205–266. Springer International Publishing, Cham.

Wagner M, Hendy IL, Lai B. 2022. Characterizing Ag uptake and storage in the marine diatom Thalassiosira pseudonana: Implications for Ag biogeochemical cycling. Marine Chemistry 247: 104175.