Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.4776

Aerobic Anoxygenic Phototrophic Metal Transformations Associated with *Dreissena polymorpha*

STEVEN B KUZYK, JOCELYN PLOUFFE, KAITLYN WIENS, XIAO MA AND VLADIMIR YURKOV

University of Manitoba

Presenting Author: umkuzyks@myumanitoba.ca

The zebra mussel has been introduced to Lake Winnipeg, the 11th largest freshwater lake in the world, as recently as 2013. Since then an explosion in population size has occurred, likely resulting in ecological shifts. After their introduction into the Great Lakes during the 1980's, ecosystem changes resulted in decreased fish populations, and numerous other problems. While bioaccumulation has been observed for most commercial species of bivalve, including oysters, *Crassostrea virginica*, and mussels, *Mytilus edulis*, less information is available for this invasive species. Furthermore, little information exists for the methods of metal resistance in mollusca. In our study, we examined D. polymorpha discovered in Lake Winnipeg during 2017 across the South Basin. Water, sediment, and mussel homogenate were analyzed with collision/reaction cell based inductively coupled plasma mass spectrometry for the presence of 39 elements with sensitivity down to the ppb. In contrast to lake water, all elements were detected >10x higher in numbers within bivalves, except for Mg, which was 6x more. Regarding metals typically examined in mollusc tissues, Cr, Co, Mg, Ni, Fe, Zn, Cd, Pb and Cu were found elevated over 200x of that in the surrounding waters. Comparing zebra mussels to sediment, 7 elements are increased, Na>St>Ba>Ca>P>Cd>Cu>Se, suggesting their significant bioaccumulation. Interestingly, both Se and V were elevated in tissues, where Se is chemically similar to Te, and all three are biologically toxic when present in elevated levels. Both the microbiome of zebra mussels and the bacterial community of surrounding waters contained aerobic anoxygenic phototrophic bacteria populations. Furthermore, representatives of 11 genera were highly resistant to metal(oid) oxides TeO_3^{2-} and SeO_3^{2-} up to 750 and 1000 µg/ml, respectively, each reducing oxides to metal element forms, yielding less toxic states. Interestingly, strains relating to Porphyrobacter had their growth promoted in sub-inhibitory concentrations of TeO_3^{2-}. Potentially, there is an association of these phototrophic bacteria with filter feeders, where metal transformations occur symbiotically, rendering them less harmful to *D. polymorpha*.