Removal of Trace Amounts of Heavy Metal from Seawater Using a Novel Metal Binding Protein

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We have been working to develop a novel “heavy metal sponge” for the removal and recovery of toxic and precious metal. The technology is based on a low molecular weight protein known as metallothionein (MT). The protein has the unique ability to selectively bind heavy metals, e.g., lead, mercury, gold, and platinum. We have recently shown that the molecule also binds lanthanum, europium, and uranium. The protein is expressed in bacteria and purified to homogeneity from cell lysates by a simple and cost effective method using FPLC anion exchange chromatography. The purity of the preparation was confirmed by SDS-PAGE.

The purified MT was used to determine the potential for removing trace amounts of heavy metal from seawater. The protein was mixed with seawater containing 100 ppt (trillion) of $^{109}$Cd. The protein/metal complex was then collected using a membrane filter centrifugal device and the flow through assayed for radioactivity. The efficiency of metal binding was determined from the radioactivity in the flow through. Under these conditions, 88% of the metal was removed from the seawater after a single centrifugation. Funded in part by a grant from CSUPERB.

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