

Guest Speaker

Biological Engineering for Remediation.

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The unicellular green alga, *Chlamydomonas reinhardtii*, binds many heavy metals in a species-specific and pH-dependent manner. Significantly, *Chlamydomonas* is readily amenable to genetic manipulation to enhance its capacity to sequester and tolerate heavy metals. We have explored a variety of strategies to enhance the heavy metal binding properties of *Chlamydomonas* including, 1) the expression of the heavy metal binding protein, metallothionein-II, in the cytoplasm and on the cell surface as gene fusion products, and 2) the expression of plant stress tolerance genes that regulate proline and cysteine synthesis. We also are exploring combinatorial approaches to identify heavy metal binding peptides to be expressed on the surface of recombinant algae. Finally, we have identified unique algal proteins that are selectively expressed following heavy metal exposure. Studies are underway to determine whether constitutive expression of these proteins enhance the heavy metal binding properties of the cells. Overall, we have shown that algae expressing some of the aforementioned gene constructs have either an enhanced tolerance to toxic concentrations of heavy metals (cadmium), an increased capacity (three-fold) to bind heavy metals, or both. Each of these strategies and outcomes will be described.