M009 METAL ION SENSITIVITY AND SELECTIVITY OF MerR, A MERCURY-RESPONSIVE GENE REGULATORY PROTEIN. Diana M. Ralston, Jeffrey G. Wright, and Thomas V. O'Halloran, Northwestern University, Evanston, IL 60208, USA.

The MerR protein regulates the prokaryotic Tn501 mer operon, a plasmid-borne determinant conferring resistance to inorganic mercury. MerR functions as Hg(II) receptor and transcriptional regulator and is converted from a repressor to an activator of gene expression by Hg(II). Cd(II) and other metal ions also activate MerR, albeit at concentrations two to four orders of magnitude greater than Hg(II). Induction of the mer operon by various metals correlates with physicochemical properties of these metal ions. This correlation provides insights into the molecular basis of heavy metal recognition by a biological receptor.

M010 CHEMICAL CHARACTERIZATION OF THE HEAVY METAL RECEPTOR SITE IN THE MerR METALLOREGULATORY PROTEIN. Jeffrey G. Wright*, Diana M. Ralston*, Him-Tai Tsang†, James E. Penner-Hahn†, and Thomas V. O'Halloran*, Northwestern University, Evanston, IL 60208 USA (*), University of Michigan, Ann Arbor, MI 48109 USA (†).

The Tn501 MerR protein governs the highly selective and sensitive metal ion responsive expression of bacterial mercuric ion resistance genes. Several methods demonstrate that one mercuric ion is bound per MerR dimer in the transcriptionally active protein. Hg L_{III}-edge EXAFS and electronic spectroscopy studies of the Hg-MerR complex are consistent with mercuric ion coordination to 3 or 4 protein thiolate sulfurs. The Hg-MerR complex exhibits a rare coordination environment for mononuclear Hg-SR complexes, which are typically two coordinate. This unusual Hg(II) coordination may contribute to the high sensitivity for Hg(II) exhibited by the protein. Solid state ^{199}Hg NMR studies are underway to further characterize the heavy metal receptor site.

M011 METALLOREGULATION BY THE MERR PROTEIN: MUTAGENESIS IMPLICATES DISTINCT DNA AND MERCURY BINDING DOMAINS. Lisa M. Shewchuk and Christopher T. Walsh, Biological Chemistry and Molecular Pharmacology, Harvard Medical School, Boston, MA 02115, USA.

The MerR protein from the Tn*501* mercury resistance operon is a metalloregulatory transcriptional switch, converting from repressor to activator upon binding of a single Hg(II)/MerR dimer. Random mutagenesis has led to the identification of mutant proteins that are specifically deficient in transcriptional repression, activation, or both. Studies on site-directed cys→ala mutants have demonstrated that the transcriptionally active species is a metal bridged homo dimer via cys126 in each subunit.

[1] L.M. Shewchuk, et al., Biochemistry, 28, 2331 (1989)