Artificial Metalloenzymes going Live

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The catalytic efficiency and high selectivities achieved by natural metalloenzymes are a source of inspiration for the design of novel bio inspired catalysts. A powerful approach for creating artificial metalloenzymes involves incorporating a synthetic transition metal catalysts into a protein. We have developed a new concept for the design of artificial metalloenzymes that involves creation of a novel active site at the dimer interface of the transcription factor LmrR (Lactococcal multidrug resistance Regulator).[1] LmrR was selected as the protein scaffold because it contains an unusual large hydrophobic pocket on the dimer interface.

Two novel classes of LmrR-based artificial metalloenzymes will be presented, involving either supramolecular anchoring of the metal complex[2] or biosynthetic incorporation of an unnatural metal binding amino acid using expanded genetic code methodology.[3] These artificial metalloenzymes have been applied successfully in catalytic asymmetric C-C bond forming and hydration reactions. Here we will discuss our recent in the evolution and in vivo application of these artificial metalloenzymes.[4]

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