

Cloning, Expression, and Characterization of Superoxide dismutase from *Aquifex Pyrophilus*, a Hyperthermophilic Bacteria

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A suproxide dismutase gene of *Aquifex pyrophilus*, a novel marine hyperthermophilic bacterium, was cloned, expressed, and characterized. The SOD of *A. pyrophilus* (ApSOD) is an iron-containing homo-oligomeric protein with a monomeric molecular weight of 24.2 kDa. the amino acid sequence is similar to those of known Mn- and Fe-SODs from thermophilic archaea, and metal binding residues in all SOD sequences from different species are also conserved in *A.pyrophilus* SOD. A superoxide dismutase from *Aquifex pyrophilus* is an extremely stable enzyme against the heat, and it maintains full activity after heat treatment for 60 mins at 95°C. To understand the molecular basis of thermostability of this enzyme, we have determined the crystal structure of ApSOD at 1.9 Å with an R-factor of 17.0% and compared it with other known SOD structures from the mesophiles and a thermophile. Crystal structure of ApSOD monomer in conjunction with biochemical data suggests that increased number of ion-pairs and buried surface area are the dorminant factors in thermostable of *A.pyrophilus* Superoxide dismutase.