

Iron and Sulfur : a Reactive Bioinorganic Combination

Marc Fontecave

Laboratoire de Chimie et Biochimie des Centres Rédox Biologiques, Université J. Fourier-CEA-CNRS, UMR 5047, Grenoble, France

Since the discovery of ferredoxins in the early 1960s, the number of identified proteins that contain [Fe-S] clusters has greatly proliferated. Furthermore, [Fe-S] clusters have been shown to display a remarkable functional diversity, on the basis of a relatively limited number of structures, the most important ones being the [4Fe-4S] tetranuclear cubane and, to a lesser extent, the [2Fe-2S] dinuclear center. In *Escherichia coli*, one can establish that approximately 100 proteins function with an [Fe-S] center. It is interesting to note that most of them are one-electron transfer enzymes and that [4Fe-4S] clusters represent the vast majority of centers present in these proteins. However, during the recent years, a number of novel functions have emerged such as: regulation of gene expression, substrate binding and activation for dehydration, reduction and condensation reactions, sulfur atom transport and delivery. The reactive combination of a [4Fe-4S] cluster with S-Adenosylmethionine is certainly one of the most important discoveries in this field as it provides some insight into the mechanism of a great variety of biosynthetic pathways and metabolic reactions (cofactor synthesis, DNA synthesis and repair, tRNA modification,...): in a given organism such as *E. coli* this represents about 10% of total [Fe-S] proteins. This chemistry will be discussed in particular in the context of the anaerobic ribonucleotide reductase that P. Reichard (Stockholm) and myself discovered at the end of the 80s.

Adenosylmethionine as a source of 5'-deoxyadenosyl radicals

M. Fontecave, E. Mulliez, S. Ollagnier-de Choudens

Current Opinion in Chemical Biology 2001, 5, 506-511

Deoxyribonucleotide synthesis in anaerobic microorganisms : the class III ribonucleotide reductase

M. Fontecave, E. Mulliez, D. Logan

Progress in Nucleic Acid Research and Molecular Biology 2002, 72, 95-127

Biological radical sulfur insertion reactions

M. Fontecave, S. Ollagnier-de Choudens, E. Mulliez

Chem. Rev. 2003, 103, 2149-2166

MiaB protein is a bifunctional « radical-SAM » enzyme involved in thiolation and methylation of tRNA

F. Pierrel, T. Douki, M. Fontecave, M. Atta

J. Biol. Chem. 2004, 279, 47555-47563