Séminaire

CONFÉRENCIER INVITÉ

Vendredi 27 Mars 2020 à 11h

Salle des séminaires IBS

Institut de biologie structurale - 71 avenue des Martyrs CS 10090 38044 Grenoble Cedex 9 - T.+33 (0)4 57 42 85 00

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NiSOD: Reinventing the Wheel

Superoxide Dismutases (SODs) are metalloenzymes that utilize the one-electron redox chemistry of a transition metal to catalyze the disproportionation of superoxide ($O_2^{\bullet-}$) to dioxygen and hydrogen peroxide. The catalysis involves the so-called ping-pong mechanism wherein the metal oscillates between two oxidation states to both oxidize and reduce the substrate:

$$M^{(n+1)} + O_2^{\bullet-} \rightarrow M^{n+} + O_2$$

$$M^{n+} + O_2^{\bullet-} + 2\,H^+ \rightarrow M^{(n+1)} + H_2O_2$$

$$2\,O_2^{\bullet-} + 2\,H^+ \rightarrow O_2 + H_2O_2$$

The rapid removal of superoxide helps cells to cope with the deleterious effects of superoxide and reactive oxygen species derived from superoxide. Humans have two such enzymes, a copper- and zinc-containing enzyme found mainly in erythrocytes, and a manganese enzyme found in mitochondria. In addition to these types of SOD, an iron-dependent enzyme is found in bacteria. The most recently discovered SOD (*ca.*1996) has a unique protein structure and requires nickel in its active site – NiSOD. Among the available metals, nickel seems an unlikely redox center. This seminar will discuss the protein adaptations required in order to use nickel for biological redox catalysis in general and SOD catalysis in particular. The approach involves systematically altering the nickel ligands through a combination of mutagenic and synthetic approaches, structural characterization of the metal sites by a combination of crystallography and x-ray spectroscopy, and functional assessment via kinetic studies employing pulse-radiolytic generation of superoxide. The results show that NiSOD represents a case of convergent evolution in that it employs many of the same protein features in catalysis as other SODs, but where the adaptations to the metal site are uniquely suited to using nickel as a redox center. Recent work regarding the maturation of NiSOD, which is expressed as a proenzyme and postranslationally processed at the N-terminus, will also be discussed.

Hôte : Juan Fontecilla-Camps (IBS/groupe Métalloprotéines)

L'accès au campus EPN nécessite un avis de rendez-vous

Contactez O. Cavoret (au moins 48h à l'avance) - T. 04 57 42 87 04 - email : ibs.seminaires@ibs.fr