Bio-inorganic Chemistry

Redox Metallo-proteins Group

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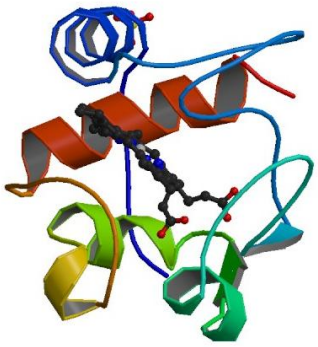

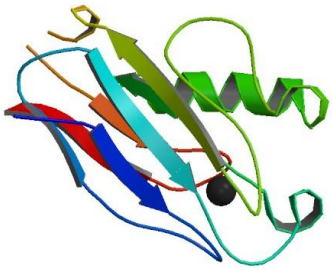

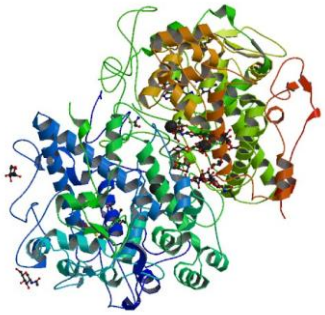

CONTACTS

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The research activity of our group is mainly devoted to the characterization of electron transport metallo-proteins and redox metallo-enzymes, exploiting direct electrochemistry and UV-Vis spectro-electrochemistry, along with NMR, MCD and electronic spectroscopies, site-directed mutagenesis and computational techniques. We are presently focusing on the following issues:

- Analysis of the redox reactivity and of the catalytic properties of the monolayers formed by cytochrome *c* mutants with increased enzymatic activity, immobilized on gold electrodes. We aim at verifying the possibility to successfully develop protein-based bio-molecular devices, such as bio-sensors for small molecules of biological and environmental interest (dioxygen, nitrous oxide, nitrite ion, peroxides).
- Understanding of the determinants of the reduction potential of redox metalloenzymes (mainly heme peroxidases) and ET metalloproteins. We tackled this problem with a thermodynamic approach by measuring the enthalpic and entropic contributions to the free energy change upon protein reduction, through variable-temperature protein spectroelectrochemistry or voltammetry. These thermodynamic parameters are related to *i)* the features of the first coordination sphere of the metal center, *ii)* the electrostatic interactions of the metal center with the protein matrix and the solvent, *iii)* the general ionic strength effects and specific protein-ion binding, *iv)* the differences in protein flexibility and solvation properties of the two redox states.
- Understanding the molecular factors that control the thermodynamics of *i)* the pH-dependent conformational equilibria, involving changes in metal coordination, and *ii)* the unfolding processes of mitochondrial and bacterial cytochromes *c* and in blue copper proteins.

Instrumentation available

Two PAR mod. 273A Potentiostats/Galvanostats
One AMEL mod. 533 Potentiostat/Galvanostat
One CARY C50 UV-vis spetrophotometer
UV-vis spectroelectrochemical instrumentation
Low-pressure chromatographic systems for protein purification

Collaborations

Prof. C. Amatore (Ecole Normale Supérieure, Paris), Dr. C Dennison (Newcastle University, Newcastle upon Tyne), Prof. P. Hildebrandt, Technische Universität Berlin), Prof. C. Obinger (Univ. of Natural Resources and Life Sciences, Vienna), Prof. V. Pavone e A. Lombardi (Univ. Federico II, Napoli), Dr. C. Tavagnacco (Univ. di Trieste), Dr. G. van der Zwan (Vrije Universiteit, Amsterdam).