Title	**Hydrogenases, key enzymes in the production of bio-hydrogen**
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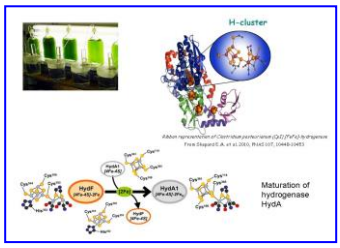
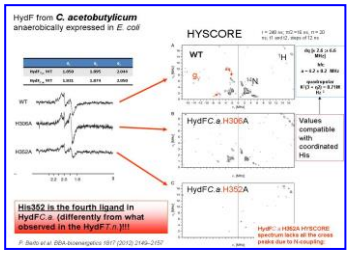
Project description: [FeFe]-hydrogenases are key enzymes for bioproduction of molecular hydrogen. Several efforts are currently underway to understand how their active site is assembled, and to improve the development of bioinspired hydrogenase analogs in renewable energy applications. Hydrogenases are metalloenzymes which are able to produce molecular hydrogen starting from protons and electrons provided by reduced substrates. Interestingly in green algae this reaction can be coupled to photosynthesis. [Fe-Fe]-hydrogenases are the most efficient enzymes in H_2 production, however they are rapidly inactivated by oxygen and the maturation of these enzymes is a complex process which requires the action of several other proteins. Both hydrogenase and maturation proteins are under investigation in our group, in collaboration with Dr. Paola Costantini, Department of Biology, University of Padova. A deeper understanding of H-cluster synthesis will facilitate the engineering of biotechnologies that use hydrogenases or synthetic catalysts inspired by them. Advanced EPR techniques and Fluorescence Resonance Energy Transfer (FRET) will be used to get information on the structure-function relationship in these metalloenzymes.





Publications:

1. Galazzo, L; Maso, L; De Rosa, E; Bortolus, M; Doni, D; Acquasaliente, L; De Filippis, V; Carbonera, D. Identifying conformational changes with site-directed spin labeling reveals that the GTPase domain of HydF is a molecular switch. (2017) *Scientific Reports* 7, 2045-2322

2. Di Valentin, M., Dal Farra, MG., Galazzo, L., Albertini, M., Schulte, T., Hofmann, E., Carbonera, D., Distance measurements in peridinin-chlorophyll a-protein by light-induced PELDOR spectroscopy. Analysis of triplet state localization (2016) *Biochimica et Biophysica Acta - Bioenergetics* 1857, 1909-1916

3. Di Valentin, M., Albertini, M., Zurlo, E., Gobbo, M., Carbonera, D. Porphyrin triplet state as a potential Spin label for nanometer distance measurements by peldor spectroscopy (2014) *Journal of the American Chemical Society*, 136 (18), pp. 6582-6585.

4. Albertini, M., Vallese, F., Di Valentin, M., Berto, P., Giacometti, G.M., Costantini, P., Carbonera, D. The proton iron-sulfur cluster environment of the [FeFe]-hydrogenase maturation protein HydF from Thermotoga neapolitana (2014) International *Journal of Hydrogen Energy*, 39 (32), pp. 18574-1858

5. Berto, P., Di Valentin, M., Cendron, L., Vallese, F., Albertini, M., Salvadori, E., Giacometti, G.M., Carbonera, D., Costantini, P. The [4Fe-4S]-cluster coordination of [FeFe]-hydrogenase maturation protein HydF as revealed by EPR and HYSCORE spectroscopies (2012) *Biochimica et Biophysica Acta - Bioenergetics*, 1817 (12), pp. 2149-2157

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