

BioH₂ production in a synthetic bacterial consortium: How QS molecules control interactions between bacterial species with concomitant changes in the distribution of metabolic fluxes

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Abstract

Formation of multi-species communities allows nearly every niche on earth to be colonized. Exchange of molecular information among neighbouring bacteria in such communities is crucial for the bacteria to thrive. Yet the principles controlling these inter-species interactions are poorly defined. To shed light on them, we developed a synthetic microbial consortium with two anaerobic bacteria, *Clostridium acetobutylicum* and *Desulfovibrio vulgaris* Hildenborough. these 2 bacteria can be found together in Nature involved in anaerobic digestion of organic waste matter and in consequence in BIO-H₂ production. Our studies demonstrate that for cell-cell interaction can allow to overcome nutrient starvation and that many materials can be passed from one cell to another. This physical interaction induces changes in the distribution of metabolic fluxes and allows a substantial increase in H₂ production without requiring genetic engineering. We identify that the agent necessary for these physical interactions between *C. acetobutylicum* and *D. vulgaris* (or *E. coli* and *D. vulgaris*), with the consequent metabolic exchanges, is the quorum-sensing molecule.



Biography:

Marie-Thérèse Giudici-Orticoni is director of the Laboratory of Bioenergetics and Protein Engineering, director of the Mediterranean Institute of Microbiology (350 people), director of the Institute of Microbiology, Bioenergy and Biotechnology of Aix-Marseille University (10 laboratories, 14 platforms). Her group has characterized the main metabolic chains of microorganisms, and now studying their dynamics and interactions under different conditions. She has initiated an innovative axis of ecological engineering, which consists in the microbial study of bacterial consortia involved in bioH₂ production. The

objective is to establish the parameters governing the metabolic networks in view of biotechnological applications. She is author of 98 publications in refereed journals, scientific coordinator for national and international programs.



Speaker Publications:

1. Roger, Magali & Biaso, Frederic & Castelle, Cindy & Bauzan, Marielle & Chaspoul, Florence & Lojou, Elisabeth & Sciara, Giuliano & Caffarri, Stefano & Giudici-Orticoni, Marie-Thérèse & Ilbert, Marianne. (2014). Spectroscopic Characterization of a Green Copper Site in a Single-Domain Cupredoxin. *PloS one*. 9. e98941. 10.1371/journal.pone.0098941.
2. De Poulpique, Anne & Ranava, David & Monsalve, Karen & Giudici-Orticoni, Marie-Thérèse & Lojou, Elisabeth. (2014). Biohydrogen for a New Generation of H₂/O₂ Biofuel Cells: A Sustainable Energy Perspective. *ChemElectroChem*. 1. 10.1002/celec.201402249.

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