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Towards cellulose consolidated bioprocessing into biofuel through recombinant *Clostridium cellulovorans:* Detailed analysis of the central metabolism and development of optimized gene manipulation tools

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Consolidated Bioprocessing (CBP) is a key feature of the so-called 3rd generation biorefinery consisting of cost-sustainable single-step (direct) fermentation of cellulosic biomass into industrially relevant products such as biofuels (notably, ethanol and or butanol). No natural microorganism isolated so far can produce biofuels directly from cellulose with the efficiency required by industrial processes. *Clostridium cellulovorans* is an anaerobic bacterium among the most efficient plant biomass biodegraders. It efficiently hydrolyzes cellulose, xylan and pectin, but its main catabolites are organic acids, while little ethanol is biosynthesized. The final aim of the present study is the development of recombinant ethanol and or butanol hyper producing *C. cellulovorans* strains by metabolic engineering. Achievement of this purpose is currently hampered by major hurdles. Nowadays, no detailed study on *C. cellulovorans* central metabolic pathways exists. Furthermore, no specific tools for *C. cellulovorans* chromosomal gene knock out/in are available. The present contribution was focused on the development of a model of the *C. cellulovorans* central metabolism by integration of metabolomics, transcriptomics and proteomics data. Attention was mainly given to comparison of *C. cellulovorans* metabolic network during growth on cellulose with respect to cells growing on soluble sugars. As far as the development of optimized gene tools for *C. cellulovorans* is concerned, different transformation protocols were compared. Furthermore, the ClosTron methodology was used as a basis for developing reliable protocol for gene integration in the *C. cellulovorans* chromosome. These results will be a key for future *C. cellulovorans* metabolic pathway engineering aimed at direct conversion of cellulose to biofuels.

Biography

Chiara Gandini has completed her MSc in Industrial Biotechnology in 2012. She is Coauthor of an international patent. She has been working in Biochemistry Laboratory of Department of Life Sciences and Systems Biology, University of Torino, on microorganism's metabolic engineering since 2012.

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