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Construction of recombinant cellulolytic microorganisms for cellulose consolidated bioprocessing by metabolic engineering: Achievements, hurdles and perspectives

Roberto Mazzoli
University of Torino, Italy

Cellulosic biomass is the most interesting substrate for biorefinery, owing to its abundance and low cost. However, cellulose is highly recalcitrant to biodegradation. Currently available technologies for fermenting cellulose to industrially relevant compounds (e.g., fuels, plastics) consist of multiple-step processes which are not cost-competitive with traditional petrochemical refinery. Engineering recombinant microbial strains able to catalyze single-step fermentation (i.e., consolidated bioprocessing, CBP) of biomass into high-value products is a key goal so as to develop cost-competitive cellulosic biomass biorefinery. For at least 20 years, intensive research efforts have been dedicated to develop recombinant strains suitable for cellulose-CBP following either the "native cellulolytic strategy", aimed at engineering natural cellulolytic microorganisms so as to improve their product formation features or the "recombinant cellulolytic strategy" aimed at conferring cellulolytic ability to strains which naturally produce industrially-relevant products with high efficiency. Although these researches have attained impressive results, current forefront achievements yet resemble more to proofs-of-concept than to new biotechnological deliverables ready for application in industrial fermentations. The present contribution aims at providing an overview on most significant successful examples of these strategies together with major issues which still need to be addressed and possible solutions.

Biography

Roberto Mazzoli has completed his PhD in 2003 and he has been working as an Assistant Professor in Biochemistry at the University of Turin, Italy since 2011. He has been studying the metabolism of microorganisms aimed at industrial processes. His main research activity has concerned metabolic engineering of microorganisms for cellulosic consolidated biorefinery. He is the PI of the group of Proteomics and Metabolic Engineering of Prokaryotes at DBIOS, University of Turin. He has published 21 papers in peer-reviewed international journals, 1 book chapter and 2 international patents and he is serving as Editorial Board Member or Reviewer for several reputed journals.

roberto.mazzoli@unito.it

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