REZUMATUL TEZEI DE DOCTORAT (ABSTRACT)

Metabolic engineering of Escherichia coli for obtaining 1,4-butanediol from glucose and glycerol

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1,4-Butanediol is an industrial chemical with good environmental characteristics, widely used in medicine, chemical, textile, paper making, automobile, and the daily-using chemical industries. Possible applications and market potential of 1,4-butanediol is growing year by year, serving applications such as engineering polymers, solvents, and fine chemical intermediates. The high value chemical, 1,4-butanediol (BDO) cannot be naturally produced by any known organism, and to overcome this, a possible solution could be the using of genetic engineering tools, by manipulating of multistep catalytic systems involved in cell metabolism. Recombinant microorganisms, with altered sugar metabolism, are therefore able to ferment sugar to some specialty chemicals, which cannot be produced by the corresponding original strain. In fact, recent advances in process technologies, especially in fermentation technologies such as enzymatic engineering, metabolic engineering and genetic manipulation, provide new opportunities for producing a wide variety of industrial products from renewable plant resources. To produce BDO by *E. coli* a biosynthetic pathway should be firstly constructed. The reconstructed strains design may serve as an important contribution to the implementation of bio refineries by converting biofuel waste - glycerol and, of course, glucose, into a higher-value chemical compound. The main objective of the project is to produce bio based 1,4-butanediol (BDO) from the above-mentioned feedstocks using metabolically engineered *Escherichia coli* as the production strain growing on minimal medium (M9). The first hypothesis of this research is based on the possibility of using bioinformatics methods (capable of manipulating a huge amount of genomic, transcriptomic, proteomic and metabolomics data) to design and test new metabolic pathways which are naturally non-existent. The second hypothesis of this work announced that by choosing a metabolite as a starting compound, using metabolic engineering (specific gene deletions of the competing pathways) and genetic engineering (expression and overexpression of heterologous genes) tools, the carbon flux can be directed by the newly introduced biochemical reactions to produce a non-natural molecule.