
Preface

Classic strain improvement is a long process that relies on screening of naturally occurring or chemically induced mutations for improved strain performance. Rapid technology advancement has accelerated strain improvement by opening the field of metabolic engineering. Metabolic engineering is the practice of genetically optimizing metabolic and regulatory networks within cells to increase production and/or recovery of certain substance from cells. The approaches may be as simple as manipulation of a single gene, and it could also be as complex as reconstruction of the cell's networks.

The objective of *Microbial Metabolic Engineering* is to provide an overview of strategies and techniques of metabolic engineering within the scope of microbial applications mainly focused on bacteria and yeasts. The first part of the book describes methods to engineer genes, pathways, or the whole genome in the production host. The complementary approaches of rational design and random screening to tap into natural diversity and engineered diversity are both illustrated. The second part of the book describes the use of modern biotechnology tools in microbial metabolic engineering. It includes use of genetic tools, omics tools, FACS analysis, and flux balance analysis for identification of targets of genes/pathways for metabolic engineering. It also includes use of microfermentors and fermentation control techniques for rapid evaluation of engineered strains. The third part of the book describes several successful examples of metabolic engineering for real-world applications such as whole-cell biosensors and acetate control in large-scale fermentation. It also addresses several challenges in commercial production such as using biomass hydrolysates as feedstock and minimizing phage contamination.

Microbial Metabolic Engineering is intended both for researchers (molecular biologists, biochemists, microbiologists, physiologists, and bioinformaticians) in academia who are interested in understanding the gene functions and cellular network in microbes, and for those in industry who are interested in developing commercial products from microbial fermentations. It also provides fermentation engineers and process engineers an illustration of what could be achieved by metabolic engineering of the microbe that may have a significant impact on fermentation and downstream processing. The book provides step-by-step instructions, and could also be used as a text book in teaching undergraduate labs. In fact, some strains described in the book have been used in undergraduate labs in Cambridge University, UK. The chapters were written by renowned investigators in the field who practice the method on a regular basis. Procedures are described with enough details so that users can carry out the method without further reference to other sources. Advice and suggestions from the experienced investigators and troubleshooting of possible roadblocks are captured in the Notes section at the end of the chapters. In all, this book is intended to provide an overview of the key topics in microbial metabolic engineering and to be used as the guidebook for researchers who practice metabolic engineering for microbial applications.

Wilmington, DE, USA

Qiong Cheng



<http://www.springer.com/978-1-61779-482-7>

Microbial Metabolic Engineering

Methods and Protocols

Cheng, Q. (Ed.)

2012, XII, 319 p., Hardcover

ISBN: 978-1-61779-482-7

A product of Humana Press