COMPUTATIONAL MODELING OF HYDROGEN BIOSYNTHESIS PATHWAY

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INTRODUCTION

Due to the issue of sustainability, fossil fuel is no longer being a suitable source of energy for future generation. Fossil fuel being not only non-renewable, it also contributes to air pollution and global warming problems. Hydrogen becomes the most promising alternative fuel with the highest energy content per unit weight of any known fuel (142 kJ/g) and the most environment friendly gas.

Hydrogen production via biological processes have received increasing attention due to the advantages of accomplishing dual goals which are to reduce waste and produce hydrogen at the same time. However, low yield of substrate conversion and production rates of hydrogen gas have been major barriers to the practical application of biohydrogen technologies. Abo-Hasheh et al. (2011) stated that it is cause by two competing reactions which are hydrogen consumption or reductant diversion to other products and to theoretical limits of the natural metabolic pathway.

Metabolic engineering are aimed to overcome the limitations that are a part of the biochemical pathways used in hydrogen evolution. Computational modeling is one of the key methodologies of metabolic engineering. Due to the large and complex of cellular metabolic and regulatory networks, the construction and analysis of computational models of networks are very useful for identifying current network states and evaluating the effects of network perturbations on biohydrogen production.

OBJECTIVES

◆To develop and simulate computational modeling of hydrogen biosynthesis pathway in bacteria producing hydrogen to amplify the yield of hydrogen production via biological processes.

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METHODOLOGY

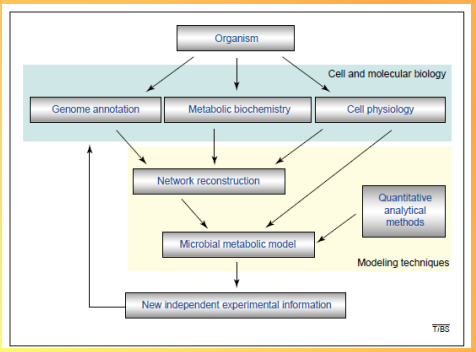

Figure 1. Integrated process of microbial metabolic model construction
(Markus et al. 2001)

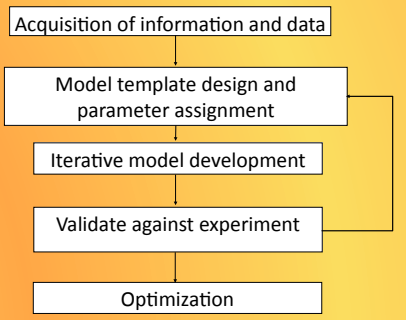

Figure 2. Conceptual framework of research approach.

BENEFIT FROM RESEARCH

This output of this research will provides better understanding of identify reactions that could be experimentally manipulated to increase biohydrogen production and provide new approach into how the structure of biochemical pathway affects biohydrogen synthesis without conducting many exhaustive experiments.

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