UPPSALA UNIVERSITET

Molecular Biotechnology Programme

Uppsala University School of Engineering

UPTEC X 14 043	Date of issue 2014-11

Author

Adam Wegelius

Title (English)

Heterologous expression of a FeFe-hydrogenase in the filamentous cyanobacterium *Nostoc Punctiforme*

Title (Swedish)

Abstract

Hydrogen gas is an excellent energy carrier and a possible biofuel. Today, hydrogen gas is produced from natural gas but there are several biological options, one of them being photobiological hydrogen production from cyanobacteria and green algae. This project initializes an investigation of producing hydrogen in the filamentous cyanobacterium *Nostoc punctiforme* from a heterologous FeFe-hydrogenase, a type of hydrogenase not naturally occurring in cyanobacteria. A shuttle vector containing a codon optimized gene encoding a FeFe-hydrogenase from *Clamydomonas reinhardtii,* capable of self replication in *N. punctiforme* was developed as well as a plasmid carrying the maturation factors assumed to be needed for a functional FeFe-hydrogenase to be formed. The native *pHupSL* (uptake hydrogenase) promoter resulting in an expression specific to heterocysts (microaerobic cells specialized for nitrogen fixation) was selected to be used in the experiments. The FeFe-hydrogenase carrying plasmid was successfully transformed into *N. punctiforme*. In addition, reporter constructs were developed to enable investigation of the activity and cell-specificity of the *pHupSL* promoter.

Keywords

FeFe-hydogenase, hydrogen, biofuel, cyanobacteria, synthetic biology

Supervisor

Peter Lindblad
Uppsala University

Scientific reviewer

Patrícia Raleiras
Uppsala University

Project name	Sponsors
Language **English**	Security **Secret until 2017-11**
ISSN 1401-2138	Classification
Supplementary bibliographical information	Pages **36**

Biology Education Centre Biomedical Center Husargatan 3 Uppsala
Box 592 S-75124 Uppsala Tel +46 (0)18 4710000 Fax +46 (0)18 471 4687