Differential Genes and Proteins

Metabolic Analysis

CC1A3

# Introduction

This document describes the metabolic changes as identified in RNASEQ and proteomics.

In this experiments *Prochlorococcus* MED4 and *Alteromonas* HOT1A3 were grown for 90 days in co-culture and mono-culture controls. The goal of the experiment is to identify the mechanisms sustaining their survival for a long time under nitrogen starvation. For that end, they were grown in a media with low nitrogen (ammonium) concentration. Samples for RNASEQ and proteomics were taken during exponential growth (timepoint 1, ~day 7), decline (timepoint 2, ~day 10) and during long term starvation (timepoint 3, 4, 5 on days 30, 60, 90 respectively).

# *Prochlorococcus* MED4

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| Figure 1: enriched KEGG pathways and modules in *Prochlorococcus* MED4. |

The following KEGG pathways are enriched in *Prochlorococcus* MED4: Membrane transport, Carbohydrates, Energy, Amino acids, Nucleotides, Lipids, Membrane transport, Translation, cofactors and vitamins, terpenoids and polyketides, other secondary metabolites.

## Membrane transport

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| Figure 2: Differentially expressed membrane transport genes and proteins in *Prochlorococcus* MED4. |

The transport systems for nitrate/nitrite, urea, and energy-coupling factors and the translocation of sec-independent protein are upregulated in the co-culture as well as in the axenic controls (though a few urea transport genes are downregulated in RNASEQ timepoint 3,4 and upregulated in the proteome and the same time).

Transport of iron(III), manganese, and phosphonate, is downregulated while the transport of phosphate and phospholipid/cholesterol/gamma-HCH and the translocation of preprotein is downregulated in the RNA and upregulated in the proteome.

The export of lipopolysaccharide is downregulated, though only 1/2 genes in the system is differentially expressed.

Other DE genes belong to:

ATP-binding cassette, subfamily B, multidrug efflux pump (mdlAB) is upregulated.

Other genes that are not differentiall expressed in coculture (but do change in the axenic contro) include, vitamin B12/bleomycin/antimicrobial peptide , signal recognition particle (ftsY, ffh) and YidC/Oxa1 family membrane protein insertase (yidC).