Supplementary Material (ESI) for Molecular BioSystems

Supplementary Text for "Genome-level reconstruction of the metabolic network in Yersinia pestis, strain 91001"; by A. Navid & E. Almaas

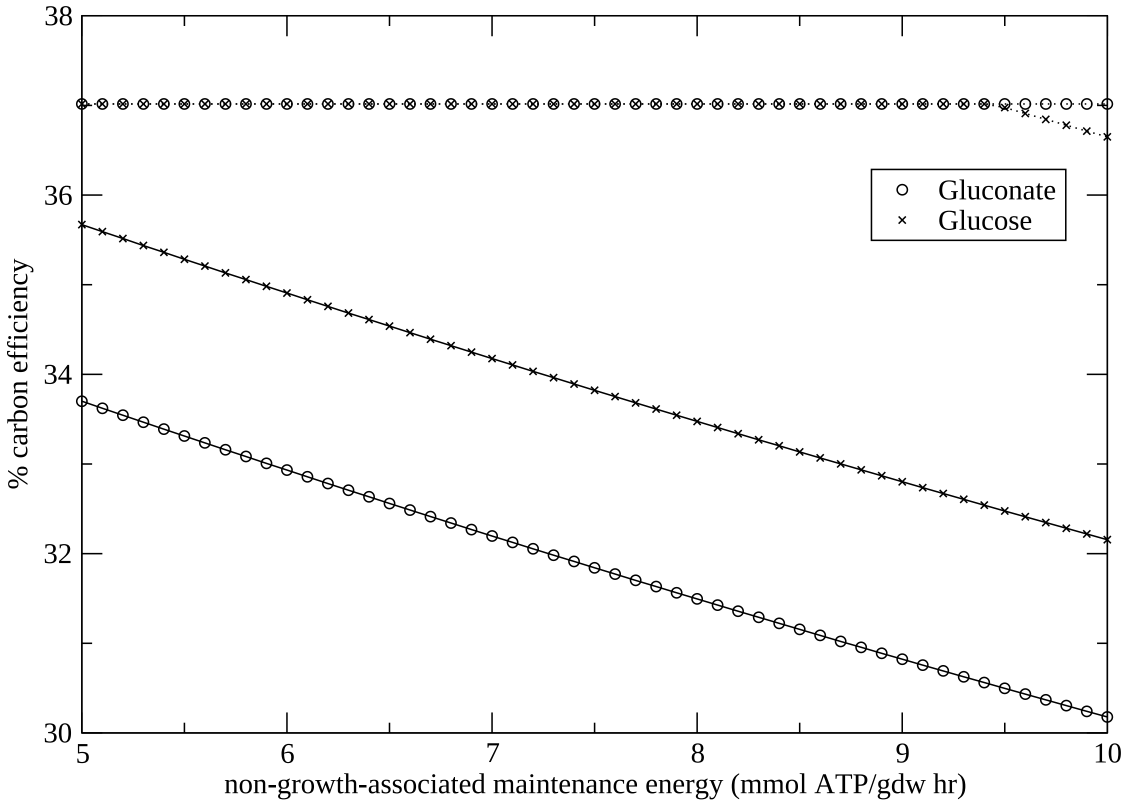
CryptFind

In order to clarify our method for identifying cryptic genes, here is a detailed account of how we determined the candidates for cryptic gene(s) that are responsible for the rhamnose negative behavior of most strains of Yersinia pestis. It is worth nothing that our modeled strain (91001) has the capability to ferment this carbohydrate.

We begin by:
1. Recognizing that the cryptic gene responsible for the rhamnose positive capability of 91001 will be critical for cellular growth in an environment where rhamnose is the only carbon source, we conduct a single gene knockout (SGKO) of YP under minimal nutritional condition with Rhamnose as the sole sugar.
2. This process identifies 173 critical genes.
3. Furthermore, we know that the cryptic gene(s) should not be critical for cellular growth under condition where rhamnose is not the primary sugar. Thus, in order to identify critical genes for these alternate conditions, we run SGKO simulations for an array of minimal nutritional conditions with differing carbohydrate sources.
4. By comparing these knockout results with our result from step 1, we can remove from our list 169 genes which are also critical under at least one other condition.
5. The remaining 4 genes are our cryptic gene candidates.

Cellular Non-growth Associated Maintenance Energy

Because of genome similarity, in our model the value of non-growth associated maintenance energy is set to the value that was previously measured for E. coli (7.6 mmol/gdw hr)[11]. In order to determine if this choice had any effects on the calculated



As shown, in nutrient poor media (dashed) variation of maintenance energy has no effect on the calculated value of carbon efficiency (slope=0). For nutrient rich media, each unit increase of maintenance energy reduces the carbon efficiency of the model by a constant value of 0.78. Based on these results we can be certain that our choice for non-growth maintenance energy does not significantly affect the calculated carbon efficiency of the model.