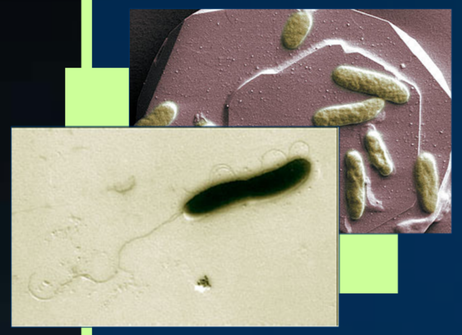
Pathway Modeling of *Shewanella denitrificans OS217*



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http://www.csm.ornl.gov/Internships/rams_06/abstracts/j_mcgarity.pdf

Abstract

To obtain the energy needed to survive in the absence of oxygen, the bacterium *Shewanella* evolved the ability to use the compounds of several metals, some of which may be toxic to humans and to other organisms. This metal-reducing capability, coupled with the fact that *Shewanella* is not harmful to humans, makes it an ideal candidate for bioremediation of contaminated areas. This project involves a functional proteomics research program, which includes functional annotation of hypothetical proteins, identification of novel protein complexes, and construction of metabolic pathways. The results of this study are expected to provide insight into *Shewanella* metabolism under various environmental conditions and to assist in the design of bioremediation programs.

Background

- Production of energy for all organisms requires terminal electron acceptor.
- Most organisms, including humans, use oxygen as terminal electron acceptor.
- Some bacteria also use heavy metal as terminal electron acceptor, changing metal to reduced form.
- Precipitation of reduced form of metal permits removal from groundwater.
- Metabolic pathways that reduce metals within bacteria are important for bioremediation.

Objectives

- Assign functional role to genes within *S. denitrificans*
- Update annotation of *S. denitrificans*
- Use Pathway Tools © to predict pathways
- Use pathways to predict effects of different stresses and environmental conditions

Methodology

- Manually annotate, or attach biological information to genomic elements, functions of genes in *S. denitrificans OS217*
- Compare and update new annotation with annotation of *S. oneidensis MR-1*
- Predict pathways with Pathway Tools © software using new annotation

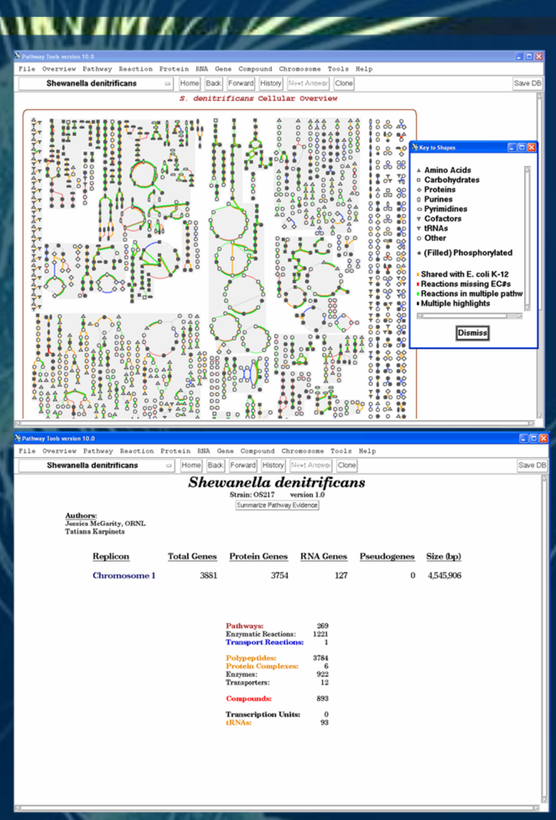

Figure 1. Pathway Tools ©: Example of pathway from *Shewanella denitrificans* OS217

Results

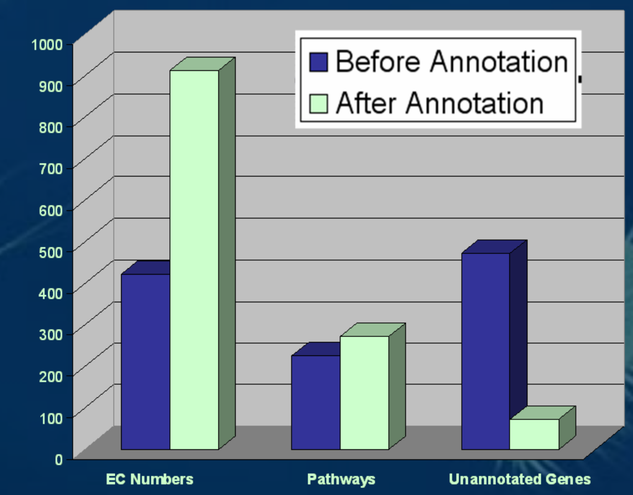

Figure 2. Results: Before and After added functional annotation of *Shewanella denitrificans OS217.*

- Updated annotation and pathways help scientists understand metal-reducing bacteria.
- Metal-reducing pathways will be used for bioremediation efforts for the Department of Energy.

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