

Annotation of the *Kytococcus sedentarius* Genome from Locus Tags Ksed_08590 to Ksed_08610

Emma Pryll*, Jonathan McDaniel* and Gabriella Rivera* and Cheryl Smith

Silver Creek High School and the Western New York Genetics in Research Partnership

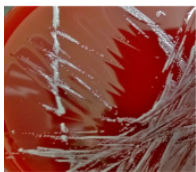
Abstract

A group of three consecutive genes from the microorganism *Kytococcus sedentarius* (Ksed_08590, Ksed_08600, Ksed_08610) were annotated using the collaborative genome annotation website GENI-ACT. The Genbank proposed gene product names for each gene that were assessed in terms of the basic genomic information, sequence-based similarity data, structure-based evidence, cellular localization data, and alternative open reading frame. The Genbank proposed gene product name and coordinates did not differ significantly from the information found for Ksed_08600, Ksed_08610 and as such, the genes appear to be correctly identified in the database. The Genbank proposed gene coordinates did differ significantly from the gene coordinates determined for Ksed_08590.

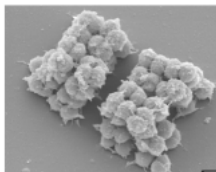
Introduction

Kytococcus sedentarius is a free-living, gram-positive bacteria, isolated from a marine environment. According to ZoBell and Upham (1944), it's known for its roles as an opportunistic pathogen causing diseases like valve endocarditis and hemorrhagic pneumonia. *Kytococcus sedentarius* is an aerobic, spherical organism. It sometimes appears in tetrads and may be surrounded by a slimy layer on smear. *Kytococcus sedentarius* is the only known producer of the antibiotics monesin A and B, that have been isolated from varying environments, including human skin and groundwater.

In terms of taxonomy, *Kytococcus sedentarius* is in the kingdom Bacteria and it's phylum and class are both Actinobacteria. *K. sedentarius* is of interest because it is a part of the not very well studied family, *Dermacoccaceae*. Though the genes of *Kytococcus sedentarius* may have been studied before, it has not been manually annotated until now.



Gram stain of *Ksedentarius* (Word Press 2014)



Kytococcus sedentarius under the scanning electron microscope (Rohde, 2016)

Modules of the GENI-ACT (<http://www.geni-act.org/>) were used to complete *Kytococcus sedentarius* genome annotation. The modules are described below:

Modules	Activities	Questions Investigated
Module 1- Basic Information Module	DNA Coordinates and Sequence, Protein Sequence	What is the sequence of my gene and protein? Where is it located in the genome?
Module 2- Sequence-Based Similarity Data	Blast, CDD, T-Coffee, WebLogo	Is my sequence similar to other sequences in Genbank?
Module 3- Cellular Localization Data	Gram Stain, TMHMM, SignalP, PSORT, Phobius	Is my protein in the cytoplasm, secreted or embedded in the membrane?
Module 4- Alternative Open Reading Frame	IMG Sequence Viewer For Alternate ORF Search	Has the amino acid sequence of my protein been called correctly by the computer?
Module 5- Structure-Based Evidence	TIGRFam, Pfam, PDB	Are there functional domains in my protein?

Results

Kytococcus sedentarius 08590:

The initial proposed product of this gene by GENI-ACT was DNA binding response regulator. This proposed gene product was supported by the top BLAST hits. The gene appeared to be very well conserved when compared to orthologs such as *Mycobacterium* as evidenced by WebLogo particularly between residues 23-235. The cellular localization indicated the gene product is cytoplasmic. The predicted start codon location of the gene was 873078 but lacked a Shine-Dalgarno sequence. There was another possible location for a start codon indicated in Figure II. As predicted, the gene product is DNA binding response regulator.

Kytococcus sedentarius 08600:

The initial proposed product of this gene by GENI-ACT was histidine kinase. Histidine kinase is a multifunctional protein in the transferase class of enzymes that play a role in signal transduction across the cellular membrane. This gene product proposal was supported by the top BLAST hits for the amino acid sequence, the presence of well-curated protein functional domains within the amino acid sequence, cellular localization indicated two helices across the cell membrane in Phobius and TMHMM. HMM Logo showed the gene was well conserved. As such, the proposed gene product is histidine kinase.

Kytococcus sedentarius 08610:

The initial proposed product of this gene was a Lipo LpqB beta propeller. The BLAST results indicated a possible hypothetical protein. A hypothetical protein is a protein that has been predicted but for which there is no experimental evidence. TMHMM predicted no transmembrane helices while Phobius and SignalP predicted a non-cytoplasmic signal peptide. The proposed gene product for Ksed_08610 is a Lipo LpqB beta propeller.

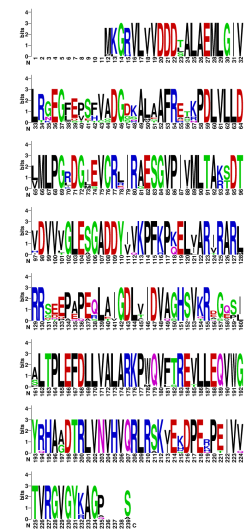


Figure I: *Kytococcus sedentarius_08590*: WebLogo shows this gene is well conserved between residues 12 and 234.

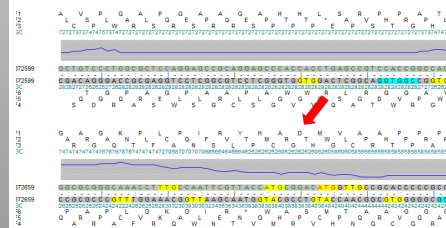


Figure II- *Kytococcus sedentarius_08590* ORF results showing start codon without an upstream Shine-Dalgarno sequence.

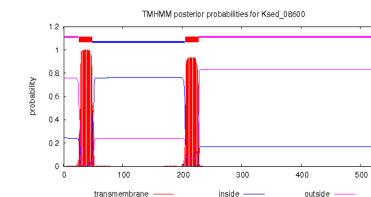


Figure III- *Kytococcus sedentarius_08600* TMHMM results indicating two transmembrane helices.

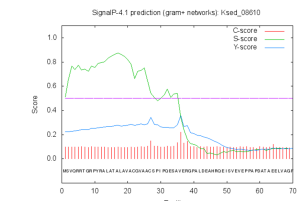


Figure IV – *Kytococcus sedentarius_08610* Signal P and Phobius results indicating a non signal peptide with deavage site between positions 35-36.

Conclusion

The GENI-ACT proposed gene products did not differ significantly from the proposed gene annotation for each of the genes in the group and the genes appear to be correctly annotated by the computer database.

Gene Locus	Gene Products	Results of Significance
Ksed_08590	DNA binding response regulator	Well conserved.
Ksed_08600	Histidine kinase	2 helices predicted
Ksed_08610	Lipoprotein LpqB Beta propeller	Signal peptide

References

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Acknowledgments

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