The Effects of Antibiotics on Biotin Development

GRP#31

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ABSTRACT

First we decided on a function of the of the bacteria within the RAST database. We decided on the process in which the cell produces biotin, a vitamin essential to the bacteria's life involved heavily in the production of fatty acids and the metabolism of various fats and amino acids. This is called "biotin biosynthesis." Next each of us found two genes within the RAST database pertaining to this particular function. To find out more information about the two genes we each selected, we looked at both surrounding genes as well as the DNA sequences. We used the BLAST site to make sure the sequences we found on the RAST database matched the actually, full DNA sequence of *E. Anophelis*. Lastly we searched an excel document provided to us by the professor containing the entire transcriptome of *E. Anophelis*. Once there we were tasked with finding each each and noting down the total number of transcriptions from three separate experimental groups. One grown with the addition of Cefotaxime, one with Imipenem and a control.

MATERIALS AND METHODS

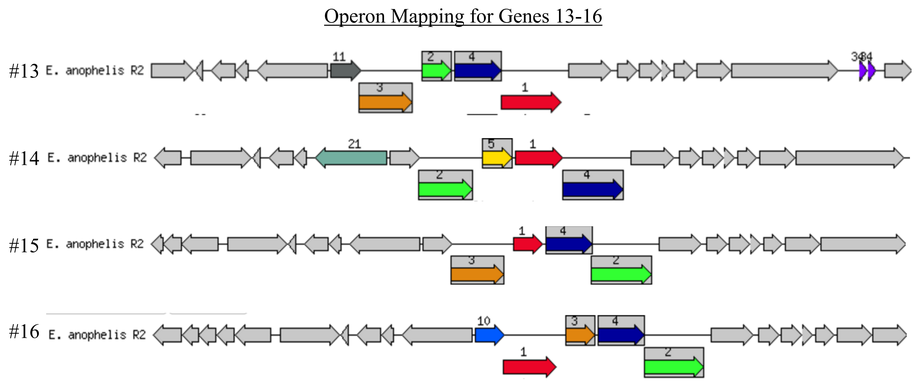
Elizabethkingia Anophelis R26 is a gram negative, single, rod shaped bacteria which is resistant to most antibiotics. This particular bacteria was originally found in the gut of the anophelis mosquito and is prone to causing human diseases Our goal was to search the RAST database for a certain function of the bacteria, locate the genes associated with that function and find out, under specific conditions, whether or not these particular genes undergo transcription at a decreased or increased rate. To find this data we used an excel sheet which listed transcriptions for nearly every gene belonging to *E. Anophelis*. Using this data we were able to determine under what conditions cause our gene to become more active. We found that there was an operon containing 4 genes. This means that these genes are linked and are responsible for regulating other genes that cause protein synthesis. For further studies, it would be beneficial to study this operon more closely; we would be able to discover more about *Elizabethkingia Anophelis R26.*

RESULTS

Gene Number	Control	Cefotax	Imipenem	Total	Fold Change
13	1	2	1	4	C/C:+2.0 I/C:-1.0
14	21	14	24	59	C/C:-1.1 I/C:+1.1
15	5	4	4	13	C/C:-1.3 I/C:-1.3
16	211	323	126	660	C/C:+1.5 I/C:-1.7
1685	7	12	8	27	C/C:+1.5 I/C:-1.7
2495	1	2	1	4	C/C:+2.0 I/C:-1.0
2579	549	832	299	1680	C/C:+1.5 I/C:-1.8

For each of the interesting genes listed in the chart, we researched the transcription patterns and fold changes. Based on what was listed, it is determind that each gene becomes more active when exposed to the Cefotax antibiotic, but less so when exposed to Imipenem.

Operon Mapping for Genes 13-16



INTRODUCTION

The function we picked within *E. Anophelis* was the process of Biotin Biosynthesis, a protein involved in the synthesis of biotin. Biotin is a vitamin necessary for cell growth. It is involved heavily in the production of fatty acids as well as the metabolism of fats and amino acids. The protein we looked into creates this important vitamin under various conditions. For our research we looked at *E. Anophelis* which had been exposed to Cefotax and Imipenem during their growth as well as a control group. Overall we needed to see under what conditions, if any, our gene was more active and by how much.

DISCUSSION

We were able to find that within the bacteria *Elizabethkingia Anophelis R26*, there are 4 genes that are next to each other called an operon. Adenosylmethionine-8-amino-7-oxononanoate aminotransferase, Biotin synthase, Dethiobiotin Synthesis and 8-amino-7-oxononanoate synthase are related. An operon is a group of genes or segment of DNA that operate as a single transcription unit. Operons allow the cell to produce proteins only when and where they are needed. Since it does this it allows the cell to conserve energy, which is good for the organism when it doesn't receive any nutrients. Along with the discovery of an operon, we discovered that under the three different growth conditions, normal, cefotax and imipenem, our genes were more active when the culture was exposed to cefotax as seen in the table of the results section. Perhaps this could be a sign that *E. Anophelis* is more susceptible to the antibiotic cefotax as it has to produce more of this particular enzyme in every gene.

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