CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

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Project Number

22011

Project Title

Genomic Comparison Between Pathogenic A. actinomycetemcomitans and Non-Pathogenic H. aphrophilus

Abstract

Objectives/Goals

The objective of my project was to find the fragments of DNA that were present in A.actinomycetemcomitans (A.a.) and not present in H.aphrophilus (H.a.). A.a. is the bacteria associated with juvenile periodontitis and H.a. is its harmless, phylogenetic cousin.

Methods/Materials

The method of Representational Difference Analysis (RDA) was employed to reveal the differences between A. actinomycetemcomitans and H. aphrophilus. It is essentially a subtraction method that allows only the DNA fragments unique to A.a. to be replicated by Polymerase Chain Reaction (PCR).

Results

Eight fragments of DNA from A. actinomycetemcomitans were found, cloned into competent cells, and sequenced. Those sequences were later compared to other genomes decoded online on such websites as NCBI and Oklahoma University. Homologues to four of these fragments were found and compared, the four others found no homology to either sites' databases. Therefore, these fragments are deemed to be unique to A.a. (concluded from the information on the database) and some of them are even unique to the particular strain used, D-7.

Conclusions/Discussion

These fragments were matched to other pathogenic bacteria (such as: Multocida tuberculosis, and Escherichia coli, for example), leading to the possibility that several of these pathogenic bacteria sha| similar genes that allow them to be pathogenic. The fragments coded for such things as sensory kinases, methionine aminopeptidases, etc. These functions could be the reason why A.a. causes juvenilp periodontitis and H.a. is completely commensal. For example, the sensory kinase could help A.a. sense other bacteria in the mouth, competeing for a similar ecological niche.

Summary Statement

The project focuses on finding the genomic differences between A. actinomyctemcomitans and H. aphrophilus in hopes of finding the genes responsible for making A. actinomyctemcomitans pathogenic and H. aphrophilus merely commensal.

Help Received

Dr. Casey Chen for letting me use the lab in USC and helping me in the project, Dr. Wei-zhen Chen and Dr. Ying Wang for helping me do the project. Mom, Dad, Mabel, and Weikuo for support,

Preliminary