CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

S0517

Project Title

Mathematical Models of Cancer Development in the Human Digestive System

Abstract

Objectives/Goals

The objective of this study is to find a possible correlation between mutations in tumor suppressor genes and an oncogene KRAS by using data mining and statistics as a novel application of bioinformatics. In order to identify the correlation between different subsets of human tumor samples for mutations in coding regions, the most common mutations in human cancer have been identified in the molecular level as codon 273 and 175 for p53, and 12, 13, and 61 for KRAS.

Methods/Materials

A Microsoft Excel program on the laptop was used to conduct the calculations, while verified on a graphing calculator. Upon creating three tables for the gastrointestinal tract, digestive system, and gene expression, use the data analysis command in Excel. Analyze the Regression Statistics found in the Summary Output and compute a least squares regression line for each data table.

Results

In the gastrointestinal tract, there was a negative, weak correlation, indicating that the frequencies of KRAS mutations decreased as that of p53 mutations increased. When analyzing the digestive system, the correlation grew a little stronger, but the direction changed to a positive direction. When both genes were over-expressed, there was a moderate strong positive correlation, but the under-expressed mutations had a weak correlation in the negative direction.

Conclusions/Discussion

The results of the occurrences of the p53 and KRAS mutations can be deemed inconclusive since there appeared to be little correlation between the frequencies of mutations in both genes. On the other hand, while there was a potential correlation found when both mutations were over-expressed, under-expressed mutations shared the weak associations from the calculations for the digestive system. It becomes possible to show improved efficiency in predicting the occurrence of a mutation in one gene given the other if a stronger correlation is established by creating a nonlinear relationship.

Summary Statement

Since there appeared to be little correlation between the frequencies of mutations in the p53 and KRAS gene, we can conclude that these two occurrences are mutually exclusive from one another.

Help Received

My uncle inspired me to investigate the effects of mutations in the p53 gene, thus paving the way for this project. The COSMIC database was invaluable for the data mining process.