Analyzing the Effects of CRISPR

Nimocks, Melannie (School: College Park High School)

CRISPR is a rising gene editing technique that, although unprecedented in medical applications, has been found to cause unintentional edits that have fatal effects on an organism. In order to determine the extent of potential damage induced by CRISPR and develop further understanding of this technology, seven samples of K-12 Escherichia coli were genetically altered using cr:tracrRNA and Cas-9, and three samples were grown under controlled conditions. The DNA of both groups was amplified using Polymerase Chain Reaction, then was purified and sequenced. The results of the sequencing from the edited Escherichia coli were compared to the results from the control group in order to determine what percentage of the DNA of the edited samples differed from the control DNA as a result of CRISPR. It was hypothesized that there would be a significant amount of unintentional gene edits to the bacteria. Once the samples DNA were aligned and analyzed, it was found that 24 out of 884 bases unexpectedly differed. Statistical analysis revealed that there was a 6.85 x 10 E-7 chance that these differences were due to normal sampling variation alone. As there was a significant level of unintentional gene edits present, the integrity of CRISPR should be brought into question and further refined before it is used commercially. Currently, many researchers focus on developing CRISPR in order to more efficiently edit microbes, crops, and other organisms to serve a beneficial purpose, such as eliminating pollutants. As such, understanding of the way that CRISPR technology functions, as well as the risks associated with it, are vital to the development of this technology so that it may be further refined. Further research will explore how to reduce these dangerous off-target effects.

Awards Won: