CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22610

Project Title
PCR: How Much DNA Do You Need?

Abstract

Objectives/Goals
How little DNA is necessary to amplify a gene by polymerase chain reaction (PCR)? My objective was to determine the optimal conditions for PCR to amplify the tubulin gene from the smallest amount of fruitfly DNA. I believe that DNA from one fly will be enough, but perhaps I can use even less.

Methods/Materials
I used programmable PCR amplifier machine, Taq polymerase, nucleotide primers, buffers and nucleotides, gel apparatus, eagle eye detector for fluorescent DNA products. I used DNA from fruitflies to amplify a piece of the tubulin gene with two specific DNA primers. I determined the optimal conditions for a PCR reaction by varying several parameters such as annealing temperature and the number oft amplification cycles.

Results
Using these optimal conditions I showed that PCR was indeed able to amplify DNA from a single flt Experiments were repeated several times, and by diluting the DNA from a single fly up to 1000 fold, I calculated that I could amplify the tubulin gene from as little as 25 picograms of total fly DNA or 10-12 grams of total fly DNA.

Conclusions/Discussion
The polymerase chain reaction, PCR, is a very powerful method for amplifying small amounts of DNA if one knows the optimal conditions. I was able to show that only a very small amount of DNA is needed to "xerox" many copies of the targeted DNA for further biological studies. That is why PCR is also used in forensics and in criminal investigations

Summary Statement
To find the optimal conditions at which PCR reactions occur and to find the minimal amount of fruitfly DNA needed to amplify a single copy gene.

Help Received
Used lab equipment at UCI under the supervision of Dr. Harald Biessmann