CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
J0519

Project Title
PCR in Action: The Study of Magnets Representing the Process of Copying DNA

Abstract

Objectives/Goals
The Polymerase Chain Reaction is a process that scientists use to copy DNA. They use a primer and anneal it to a selected piece of DNA, called a template. This experiment replicates the process by constructing a magnet template and magnet primers to see how matches and mismatches affect the ability of the primers to stick to DNA that is copied during PCR. If there is a greater amount of magnets matches in a strand, then the annealing ability between it and the template will increase.

Methods/Materials
A model DNA template is made by placing 10 magnets (all facing the same direction) along one edge of a strip of packing tape, then folding the other side of the tape over the magnets so that they are all wrapped up in one long strand. Similarly made, smaller strands (primers) are 5 magnets long, but the magnetic sequences of their poles will be different. One end of the larger magnetic (DNA) sequence is fixed from overhead so that it freely hangs. Then, we attach each primer strip one by one to the DNA template. Each primer strip will have a hole punched at the lower end so that a paper cup can be hooked to it. The strength of each bond will be measured by the amount of pennies it can hold until it drops.

Results
The results of the experiment conclude that the more magnetic matches there are in a sequence, the stronger the primer strand anneals to template. But something else was observed. When a magnet primer has the same amount of matches or mismatches, the sequence can also affect the result. When more matches were grouped together, the results showed the primer was more strongly attached to the template.

Conclusions/Discussion
Comparing all the evidence, the hypothesis is supported. Supposedly, this project was about how more matches affected the strength of the bond, which seemed self-evident. But through trial and error, it was determined that the sequence of matches also matters. When the magnets that attract are grouped together instead of spread apart, they create a stronger bond. The outcome means that in order to have a sturdy primer to replicate DNA, scientists should make sure that there are more matches of the bases so the copies of DNA bond better.

Summary Statement
How matches and mismatches affect the ability of primers to anneal to DNA that is copied during PCR.

Help Received
Mom helped type research report. Sister helped with some computer difficulties; Dad helped take pictures, edit some writing, and arrange information on board; Science teacher, Mrs. Burnett provided suggestions to improve project for County Fair; Millikan librarian, Mrs. Carrol proofread and gave suggestions for