



## Colorado Science and Engineering Fair

## 2024 Individual Project Abstract Form

**Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.**

Title of Project: Gene Knock-out With CRISPR

Finalist's Name: Hailey Rae Geva

School and City: Denver School of Science and Technology: Montview High School, Denver

Sponsor's Name: Nicholas Leno

Category: Micro & Molecular Biology (MCRO)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

CRISPR, a gene-editing technology, is used to cut DNA strands, removing specific sequences within the genome through the help of a guide RNA. These cuts are repaired either through Homologous Repair (HR) or Homologous Directed Repair (HDR). HR utilizes a chromosome as a template strand whereas HDR uses a synthetic strand instead to repair cut sections. With the help of CRISPR, eukaryotic (cells with organelles) genomes can undergo additional genetic modification through knocking-in. In this process, new and desirable pairs can be inserted instead of an exact replica of the cut gene alone.

The greater the surrounding temperature, the faster the repair reaction occurs up to a certain point after which proteins begin to degrade, causing a decrease in productivity.

My experiment utilizes the MiniPCR 'Knock-out! CRISPR/Cas Gene Targeting Lab Kit' to knock out a LacZ sequence found within E.coli bacteria, testing which temperature is optimal for such reactions. Under normal conditions, bacteria with the LacZ sequence produce blue proteins. Once the LacZ sequence is removed, white bacteria is produced instead.

My goal is to determine the optimal conditions at which CRISPR repair occurs, as indicated by levels of bacterial growth following transformation.

I hope to apply my findings to the medical field, informing doctors as to which temperatures are safe to operate on in human genetic experiments. I also aim to use this as an opportunity to educate others on CRISPR, demystify gene editing, and advocate for the accessibility of such technologies in my school and local medical community.

*I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.*

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.