



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: Exploring the Antimicrobial Effects of Phenethyl Isothiocyanate

Finalist's Name: Armaan Gill

School and City: Lamar High School, Lamar

Sponsor's Name: Robin Staker

Category: Micro & Molecular Biology

Division: Senior (9th- 12th grades)

Abstract (250 words or less):

Over 2.8 million antimicrobial-resistant infections occurred within the United States this past year resulting in the deaths of over 36,000 people. Antimicrobial-resistance is when microorganisms become resistant to antimicrobials, rendering them immune to many traditionally used medications. My project hopes to address this issue by exploring potential alternatives to pre-existing options while also building a foundation for possible anticancer agents.

Previous research has shown Phenethyl Isothiocyanate (PEITC) to be an effective antimicrobial and anticancer agent. Unfortunately, this compound generates high levels of Reactive Oxygen Species (ROS) leading to DNA and protein damage within healthy cells. It was hypothesized this issue would be counteracted through the usage of a potent antioxidant and microbial, Ascorbic Acid. To test this, well plates were prepared with each containing 50 microliters of E.coli bacteria, 100 microliters of DMEM medium, and 30 microliters each of PEITC and Ascorbic Acid. Diluted 0.5 percent Dimethyl Sulfoxide (DMSO) was used as a solvent for both of these compounds, so a comparable amount of DMSO was added to each control plate ensuring uniformity. After twelve hours of incubation, samples were taken from various columns on the well plate to measure bacterial growth. Afterward, a DCFH-DA assay test was performed to measure ROS production within each well.

Results showed a significant reduction in bacterial growth within wells that contained Ascorbic Acid, PEITC, or a combination of both. Wells that had a combination of PEITC and Ascorbic Acid exhibited reduced ROS levels along with inhibition of bacterial growth.

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: Armaan Gill

Date: 2/9/2024

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 your Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.