



## Colorado Science and Engineering Fair

## 2025 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: Space-Safe Green Cleaners: Battling Bacteria on the ISS

Finalist's Name: Isabella Widler

School and City: Green Mountain High School Lakewood

Sponsor's Name: Jennifer Flores

Category: Biomedical & Health Sciences

Division: Senior (grades 9 - 12)

Abstract (250 words or less):

This study investigates the effectiveness of natural antibacterials—coconut oil, manuka honey, and aloe vera—in combating bacterial biofilms, particularly those found on the International Space Station (ISS). Biofilms are resilient bacterial colonies that pose contamination risks in space environments, making effective antibacterial solutions essential. By simulating ISS biofilm conditions, researchers tested these natural substances to determine their antibacterial efficacy. Based on prior research, it was hypothesized that aloe vera would be the most effective due to its known antibacterial properties. The results confirmed this hypothesis, with aloe vera reducing bacterial colonies by 57%, making it the most effective green antibacterial. Coconut oil followed with a 39% reduction, while manuka honey had the lowest effect, reducing colonies by 23%. These findings align with previous studies indicating that natural ingredients can possess strong antibacterial properties. Furthermore, aloe vera's effectiveness was comparable to hydrogen peroxide, a conventional chemical cleaner, which achieved a 62% reduction in bacterial colonies. This suggests that green cleaners like aloe vera could serve as viable alternatives to chemical disinfectants in space environments. The study's findings highlight aloe vera's potential as a reliable, space-safe antibacterial agent for managing biofilms on the ISS. Future research could explore genetically modified aloe vera strains for enhanced antibacterial properties, as well as the feasibility of growing aloe vera aboard the ISS. Utilizing natural antibacterial solutions in space promotes sustainability and reduces astronauts' exposure to harsh chemicals, making aloe vera a promising candidate for biofilm management in long-duration missions.

*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.**