



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: Experimental Change to Alpha 1 Antitrypsin

Finalist's Name: Logan Overkill

School and City: Genoa-Hugo, Hugo

Sponsor's Name: Mr. William Mallory

Category: Mathematics & Computer Sciences (MACS)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

This experiment aims to alter improperly formed Alpha-1 Antitrypsin (ATT) protein structures into functioning ATT proteins. Improperly formed ATT proteins don't bond to neutrophil elastase, causing a lack of breath and chronic lung conditions. Solutions are limited to intravenous injections of ATT from blood donors and patient genome editing. For this experiment, correlating proteins of ATT will be modeled in a program called PyRosetta. This will be the overall testing grounds for protein design and function testing.

Alpha 1 Antitrypsin is an enzyme that permanently bonds to neutrophil elastase and other tissue-damaging proteins, causing them to be ineffective. This enzyme is produced in the liver. When a person's DNA improperly builds this protein, lung issues before the age of 40 may occur. I aimed to create an enzyme to correct these mutated proteins to their original function.

The hypothesis was that forms of damaged ATT proteins might be recovered for proper use, allowing the patient's body to elongate the period between required treatments, providing an overall healthier patient. The secondary protein injected will correct the material already produced by the body, allowing the patient to perform while reducing the side effects of Alpha-1 Antitrypsin Deficiency.

Downloading PyRosetta, Foldit, Foldit Standalone, and PyMOL, proper file communication, and using Linux made the task extremely difficult. Communication between the programs was successfully established. Unfortunately, an enzyme had yet to be made.

No enzymes have been conclusive. WSL, Ubuntu, BASH, PyRosetta, PyMOL, and Foldit have been downloaded. Testing will continue next year.

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: *Logan Overkill*

Date: *02/26/2024*

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