



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: Genetically Enhancing Fungi to Bioremediate Tetracycline

Finalist's Name: Cami Wolkow

School and City: William J. Palmer, Colorado Springs

Sponsor's Name: Tom Wolkow

Category: Mathematics & Computer Sciences

Division: Senior (grades 9 - 12)

Abstract (250 words or less):

Antibiotics are among the most widely used medications worldwide. Although commonly known for treating human infections, 80% of antibiotic prescriptions are used in agricultural settings (Martin 2018). Agricultural antibiotics, such as tetracycline, accumulate in the environment and allow for the selection of antibiotic-resistant bacteria (ARB). For these past three years, I have investigated fungal bioremediation capabilities as a potential solution to preserving our planet. Last year, I learned to genetically engineer yeast using CRISPR/Cas9. Building off this, this year, I am using CRISPR/Cas9 to create yeast that degrades tetracycline to help prevent ARB. In Yangzhou, China, a research group discovered a gene, tet(X4), encoding an enzyme that degrades tetracycline (Fan 2024). For my project, I obtained a codon-optimized version of tet(X4) on a plasmid that will allow an industrial diploid yeast strain to degrade tetracycline. My goal is to generate a stable insertion of tet(X4) into the yeast genome, enabling the yeast to degrade tetracycline. To accomplish this, I am using the white-red-white strategy (Denby 2018). Thus far, I have successfully deleted both copies of the ADE2 gene, turning yeast from white to red. My next goal is to integrate two copies of tet(X4) and ADE2 back into the red yeast and test whether this genetically modified yeast can degrade tetracycline. In the future, I will build off this by inserting multiple antibiotic degradative genes to create a super yeast strain that has the ability to degrade many antibiotics.

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.**