



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: Just When You Thought Beer Couldn't Get Any Better: Engineering an Eco-Friendly Brewing Yeast

Finalist's Name: Cameron Wolkow

School and City: Palmer High School, Colorado Springs

Sponsor's Name: Tom Wolkow

Category: Micro & Molecular Biology (MCRO)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Many applications in biotechnology and agriculture require fungi and plants. For example, the brewing industry requires yeast and a vine called *Humulus lupulus* also known as hops. A lot of beer drinkers these days are obsessed with the flavors and aromas hops produce. Unfortunately, growing hops require loads of water and land which are scarce resources. During the fermentation process, hops contain sulfur compounds that yeast cleave to make smaller sulfur compounds called thiols that release the fruity aromas so dearly loved by beer consumers. However, yeast do not cleave these sulfur compounds efficiently, forcing brewers to add massive amounts of hops. Researchers from Omega Yeast have addressed this issue by genetically engineering the popular Chico yeast brewing strain to more efficiently cleave these sulfur compounds from hops into thiols. The researchers did this by inserting the PatB gene from the bacteria *S. hominis* into the Chico brewing strain. PatB encodes a CS Lyase, which cleaves thiols more efficiently than the enzymes naturally in Chico, thus easing breweries' need for hops. To learn how to genetically engineer fungi, I inserted PatB into Chico using a different strategy called the Easy Clone Marker Free system sold by Addgene. In the end, I was able to successfully insert PatB into Chico. For the next PPRESF, I will investigate whether the genetically engineered strain I developed is successful in producing more thiols than Chico.

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: 3/3/24

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.