



**CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY**

<b>Name(s)</b> <b>Segen M. Chambers</b>	<b>Project Number</b> <b>J1604</b>
<b>Project Title</b> <b>Yeast Morphology Changes with Fermentation in Neutral vs. Acid pH</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Comparison of yeast growth morphology in neutral vs acidic pH when in solution during fermentation, and on agar after fermentation.</p> <p><b>Methods/Materials</b> Built a homemade microscope using cellphone and inverted laser pointer lens for magnification. Directions found online at Instructables.com.</p> <p>Fermented three yeast strains separately in two batches each, one with neutral pH, and another batch with acidic pH 2.5. Compared morphology on wet mounts with homemade microscope.</p> <p>Culture samples also plated onto malt agar to compare colony morphology after fermentation at neutral vs acid pH</p> <p><b>Results</b> Acidic pH had variable effects on morphology, specifically on formation of visible clumps (called flocs) during fermentation. Strain 1, a non-flocculating yeast, showed no changes from neutral to acid pH. Strain 2 was known to form flocs in neutral pH, but showed total loss of flocculation in acid pH. Strain 3 also formed flocs in neutral pH, but showed increased flocculation in acid pH.</p> <p>Unable to observe colony growth characteristics on agar. No growth on plates was observed after 4 days from any of the six culture-fermentation flasks.</p> <p><b>Conclusions/Discussion</b> pH levels can drastically change the morphology of yeast during fermentation, specifically with regards to clumping morphology called flocculation. The effect can vary based on the strain or species of yeast, and may have been caused from evolutionary changes over time where flocculation or lack of flocculation gave the yeast a survival advantage in its environment. My guess is that other environmental differences such as temperature, nutrient source and light could also affect morphology. Morphology of simple organisms like yeast is a characteristic that can be used in taxonomy to classify and distinguish different species.</p>	
<b>Summary Statement</b> I observed that acidic pH can change the morphology of yeast during fermentation, with differing effects on different species or strains.	
<b>Help Received</b> My primary mentor was Ms. M. Tuttle, undergrad in Dept. of Microbiology, CSU Chico. My father helped me build the microscope using power tools. My mother demonstrated how to make a wet mount, and supervised me when working with HCl and boiling solutions.	