



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Tamika C. Whitenack	Project Number S0629
Project Title The Effects of Fats on Quick Bread	
Abstract Objectives/Goals I wanted to investigate the effects of saturated and unsaturated fats on the rheology, gluten development, and final structure of a quick bread. Methods/Materials I tested three different fat sources, each with differing amounts of saturated, monounsaturated, and polyunsaturated fat (coconut, canola, and walnut oil). I baked loaves of quick bread with each type of fat. I measured the rheology of the batter by measuring the flow rate of batter down an inclined sheet pan. I measured the final structure of the quick bread using a break-test method that I have seen used by America's Test Kitchen in which a slice of quick bread is balanced between two ramekins and must hold weight. Results I found that the batters made with the higher amount of saturated fat had a slower flow rate than the batters made with unsaturated fats. Likely due to a variety of errors, I did not obtain consistent results for the break-test. An extension experiment that improved the method for the break-test found that the quick bread made with the higher amount of saturated fat took longer to break than the quick breads made with unsaturated fats. These break-test results would suggest that saturated fat causes more gluten development and a less tender final structure in quick bread. Conclusions/Discussion The flow rates showed how saturated and unsaturated fats affect the rheology of the quick bread batters differently. This is likely a result of the different molecular structure (carbon single bonds vs carbon-carbon double bonds) that cause saturated fats to be solid at room temperature and unsaturated fats to be liquid at room temperature. Molecular differences could also affect the hygroscopic properties of the different fats, which would affect the final structure of the quick bread observed from the break-test. Hygroscopic molecules attract water and minimize gluten development, resulting in a tender quick bread.	
Summary Statement My project explored how the molecular differences in saturated and unsaturated fats affected the rheology of quick bread batters and the final structure and gluten development of quick bread.	
Help Received One of my science teachers introduced me to rheology and shared past rheology experiments with me. My chemistry teacher discussed methods for performing measurements in my experiment. My mother helped me to collect the flow rates and break-times.	