



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) LeAnn Tai	Project Number J1717
Project Title Natural Alternatives for Preservation without Refrigeration	
Abstract Objectives/Goals 795 million people, or one out of nine people suffer from chronic undernourishment. Food, such as meat can spoil as quickly as a couple hours at room temperature. The objective of this research is to determine what the best natural preservative that is both commonly available and cheap against bacteria for meat is without refrigeration, and how effective the preservatives are. Methods/Materials The primary materials for the project used were beef, table salt, table sugar, distilled white vinegar, lemon juice, hydrogen peroxide, honey, mustard oil, trypticase soy agar plates, and laboratory and personal protective equipment. This experiment was done in three parts. In the first part, beef was cut into cubes and preserved in each preservative, which was then kept in the incubator at 98°F for 24 hours. Then, in the second part, the bacteria grown in the meat was washed out with 0.9% saline, and diluted with saline to a ratio of 1:10000. 20µL of the solution was applied to the plates that were preserved in the incubator at 98°F for 24 hours. Lastly, in the third part, the number of bacterial colonies was counted and recorded. The experiment was repeated 4 times for consistency and calculating the standard error. Results Ultimately, the overall ranking of the preservatives was found to be: lemon juice, vinegar, cooked (no preservative), salt water 20%, mustard oil, sugar water 1%, honey, sugar water 20%, hydrogen peroxide 1.5%, salt water 10%, sugar water 10%, sugar water 5%, salt water 1%, and salt water 5%. Lemon juice resulted to be the best natural preservative, with 100% reduction against meat without preservation. On the other hand, the least effective preservative turned out to be 5% salt water, only reducing the number of bacteria by 58%. Conclusions/Discussion The results reveal that the most effective preservative is lemon juice. The data proved my hypothesis that low pH is effective. Although my hypothesis stated that vinegar would be the best preservative, it came in as a close second. Through this project, we learned a lot about how meat can be kept for long periods of time, and suggests that some of these preservatives can be considered in the future as common preservatives.	
Summary Statement This experiment showed that lemon juice is the best natural, commonly available, and cheapest preservative for meat against bacteria without refrigeration.	
Help Received My science teacher, Mrs. Okenwa, helped and guided me to finalize the project. Kenlor Industries Inc. allowed me to perform part of my experiment in their laboratory, with Dr. Saurabh Ghosh Roy supervising throughout the process. My parents helped me with buying the materials and transportation.	