CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
J0628

Project Title
The Effect of Time and Temperature on Nitrite Level in Cooked Foods

Abstract

Objectives/Goals
Many kids bring lunch to school, and we have been hearing suggestions about what foods are suitable for lunch packing, due to concerns of nitrite content in foods stored overnight. This project aimed to evaluate the effect of storage time and temperature on nitrite level in cooked foods. My hypothesis was that nitrite level in cooked foods increases over time, but lowering the temperature in food storage helps reduce bacteria actions, and therefore decreases the speed of nitrates decomposing into nitrites.

Methods/Materials
Six types of food were randomly selected for testing: beets, cabbage, mushroom, bok choy, sausage, and shrimp. Each food was prepared in the same way, and was measured for nitrite level right after cooking to establish the baseline, using nitrite test strips. The foods were then organized into 2 groups of 6 foods each: one group stored at room temperature (controlled at 20 degrees Celsius), and the other group in a refrigerator (3 degrees). Nitrite level in each food was measured at 8, 16, 24 and 48-hour intervals after cooking. Results were compared against the baseline and prior measurements to evaluate nitrite increase.

Results
All foods showed nitrite level increase over time. Nitrate/nitrite-rich foods (beets, cabbage, and sausage) showed nitrite levels more than doubled 24-48 hours after cooking when stored at room temperature. Beets showed the highest nitrite level at 20 mg/kg after cooking; the level jumped to 40 mg/kg in 8 hours and 100 mg/kg after 48 hours. Sausage and cabbage showed similar trends but at a reduced level. Bok choy and mushroom showed the lowest nitrite level. For the test group stored in a refrigerator, results indicated that refrigeration slowed nitrite increase in all foods, and more noticeably in the nitrate-rich foods. The decline varied from 25% to 100%.

Conclusions/Discussion
This project proved my hypothesis: the longer the foods were stored, the higher the nitrite level rose due to bacterial actions that decompose nitrates into nitrites. Foods with higher nitrate/nitrite levels (such as root vegetables and cured meats) should be consumed right after cooking. Mushroom and bok choy, which showed lower nitrite level increases, are better for lunch packing and overnight storage. Refrigeration reduces bacteria actions and therefore slows nitrite increase. Leftovers or lunch boxes stored overnight should be refrigerated and consumed in less than a day or two.

Summary Statement
This project evaluated the effect of storage time and temperature on the nitrite level in cooked foods, and proposed what foods are better suited for lunch-packing, especially if prepared the night before.

Help Received
I designed and conducted the experiments, and summarized results by myself. I did research about nitrates and nitrites through internet and science magazines. My science teacher reviewed my project at school.