Name(s)

Lakshman Athappan

Project Number

S0502

Project Title

Lowering the Risks of Stomach Cancer by Finding Methods to Decrease Nitrite Levels in Various Foods

Abstract

Objectives

The aim of this study was to find out if nitrate to nitrite conversion increases over time when cooked green leafy vegetables are refrigerated and reheated. Also, vitamin C was tested to see if it can lower nitrite in refrigerated vegetables and cured bacon.

Methods

Nitrate/Nitrite test strips, pH strips, Whatman filter paper, sodium acetate, citric acid, sodium nitrate, funnel, mortar and pestle, potatoes, carrots, spinach, arugula, parsley, uncured bacon, cured bacon, and liquid vitamin C.

Testing vegetables for nitrate and nitrite: 5 grams of each vegetable was cooked with water followed by mashing, and filtering through Whatman filter paper. Filtrate was tested with nitrate test strip. Nitrite testing requires a pH of 3-5, so 100 mM citric acid buffer was used to lower the pH. Cooked vegetables were refrigerated and tested at 8, 24, and 32 hours for nitrate and nitrite. To test if vitamin C lowers nitrite, 100 mg vitamin C was added to soak the vegetable followed by testing the filtrate for nitrite.

Testing meat for nitrite: Cured meats were tested the same way as the vegetables except sodium acetate buffer (100 mM) was used adjust pH. The vitamin C test was also conducted the same way as for vegetables.

Results

Leafy greens had a minimal increase of nitrite at 8 hours. At 24 hours, nitrite levels increased 5-fold and at 32 hours, it increased 10 fold in arugula (amounting to 10 mg/L), but in spinach nitrite stayed the same as 24 hours (5 mg/L) . The nitrite level in parsley, potatoes, and carrots didn't increase at 8 hours and reached 1 mg/L at 24 hours. Adding vitamin C to arugula after cooking decreased the nitrite levels by 5-fold at 24 hours and 3-fold at 32 hours. Adding vitamin C to spinach decreased nitrite levels by 4-fold at 24 hours and 1.6-fold at 32 hours. Adding vitamin C to cooked cured bacon decreased nitrite levels by 6-fold.

Conclusions

With multiple trials of above experiments, I found that it is unsafe to eat arugula and spinach after 24 hours of cooking. Parsley, carrots, and potatoes have very low amounts of nitrite after 24 hours of cooking. Vitamin C lowers nitrite added to cured bacon (for increasing shelf life) by 6 fold. Eating a vitamin C rich food after eating reheated greens can lower nitrite by 8-fold.

Summary Statement

My study found two ways to lower nitrite levels in vegetables and meats hence lowering the risks for stomach cancer.

Help Received

My mom supervised the project and helped me find the correct dilutions for the various buffers used in the experiment.