

Investigator: Mark Richards

Project: Improving Oxidative Stability in Muscle Foods by Phospholipid Hydrolysis and Examination of the Mechanism Involved

Issue:

Lipid oxidation is a major cause of the deterioration of quality in meat and fish. It can cause discoloration, off-odors and off-flavors. Additionally, there is some concern about health implications of lipid oxidation in foods. To stop oxidation, a number of antioxidant strategies have been employed. Antioxidants extracted from plants tend to be unstable during storage or change the color or other properties of the meat. Synthetic antioxidants, while more economical and practical, come with health concerns. Researchers, therefore, are looking for additional sources of natural antioxidants to address these issues. Phospholipases A2 (PLA2) are a group of naturally-occurring enzymes that have been shown to have antioxidant effects in cod and other marine fish. The mechanism by which they work and their functions in other meats, however, are still unknown.

What has been done:

Researchers at the University of Wisconsin–Madison aimed to understand how PLA2 was inhibiting oxidation, and thus optimize its use as an antioxidant in fish and other meats. They found that PLA2 is able to limit the interaction of hemoglobin with lipids and therefore decrease hemoglobin-mediated lipid oxidation. They measured the effects of PLA2 in meats beyond fish, including turkey, chicken and pork. They found varying results in the different meats with PLA2 inhibiting oxidation in cod and pork, and accelerating oxidation in turkey and chicken. The effects of PLA2 appear to be influenced by a number of factors in meats such as muscle type, pH, heme content and free fatty acids.

Researchers took these findings further and assessed the success of PLA2 and rosemary as an antioxidant system in meats. They found that the combination provided a higher quality pork sausage than rosemary alone in both seasoned and unseasoned sausage. Conversely, they found that PLA2 and rosemary did not act as antioxidants in ground turkey. They hypothesized that there are some characteristics specific to poultry muscle that prevents PLA2 from acting as an antioxidant.

Impacts:

The investigator of this project has interacted with multiple meat industry contacts about the findings of this project, and three partners facilitated pilot plant trials at their sites. The research has also been reported at four national scientific meetings and in a food science course at UW–Madison. Two manuscripts stemming from this work have been published, and additional manuscripts are being prepared. Two graduate students were trained on this grant, and another conducted work in the topic area. A patent was also filed due to findings of this project.