Progress Report

Mississippi Center for Food Safety and Post-Harvest Technology

Title: "Inactivation of Norovirus (MNV-1) on Fresh Oysters Meat, Tuna Salad and Salmon Sushi Using X-Ray Irradiation"

Award year: 2014-2016

PI: Dr. Barakat Mahmoud

Co-PI: None

Collaborator: Dr. Sam Chang

1. Objectives.

   Objective 1- Determine the efficacy (specific doses) of X-ray irradiation on the inactivation of norovirus (MNV-1) on fresh oyster meat, tuna salad and salmon sushi.
   Objective 2- Determine the effects of X-ray treatments on the quality (color and texture) of fresh oysters meat, tuna salad and salmon sushi during storage at 5oC.
   Objective 3- Determine the effects of X-ray treatments on the shelf life of fresh oysters meat, tuna salad and salmon sushi during storage at 5oC.
   Objective 4- Determine the effects of X-ray treatments on the protein quality of fresh oyster meat, tuna salad and salmon sushi.
   Objective 5- Determine the effects of X-ray treatments on the lipid oxidation of fresh oyster meat, tuna salad and salmon sushi.

2. New Accomplishments toward objectives. Please indicate if all objectives listed were completed.
A part of the first objective was completed.

3. Objectives not accomplished and impediments to meeting objectives.

   Objective 2- Determine the effects of X-ray treatments on the quality (color and texture) of fresh oysters meat, tuna salad and salmon sushi during storage at 5oC.
   Objective 3- Determine the effects of X-ray treatments on the shelf life of fresh oysters meat, tuna salad and salmon sushi during storage at 5oC.
   Objective 4- Determine the effects of X-ray treatments on the protein quality of fresh oyster meat, tuna salad and salmon sushi.
   Objective 5- Determine the effects of X-ray treatments on the lipid oxidation of fresh oyster meat, tuna salad and salmon sushi.

4. If continuing project, when will new and/or long term objectives be completed?
   All objectives will be done in 2015-2016.

5. Students supported: **Yes**

   a. PhDs (% FTE and name): 100% (Yuwei Wu)
   b. M.S. (% FTE and name):none
   c. Undergraduate (number of students):none

6. Leveraged Funds: External Competitive Funding Applied and Awarded based on findings from this project.
   a. Applied for:

i. Funding agency;
ii. Program:
iii. Funding request ($$):

b. Awarded: Pending
i. Funding agency
ii. Program
iii. Funding awarded ($$)

7. Outputs – In addition to the above, please populate the following sections to be included in a report to be compiled in a FSI Research Accomplishment Booklet. The project report will also be posted in a FSI website to be developed.

Project Summary (Issue/Response)

Human norovirus is a major food and waterborne pathogen that causes acute gastroenteritis. Norovirus outbreaks occur worldwide and have a significant impact on public health and the economic. It is transmitted primarily through the fecal-oral route, either by direct contact with fecal matter or indirect contact through contaminated food and/or water supplies. It is highly contagious as less than 10 virus particles can cause an infection. It is estimated that over 90% of nonbacterial gastroenteritis is caused by norovirus infections. Foods at high risk of norovirus contamination include seafood and seafood products. Norovirus accounts for about 15% of seafood-associated outbreaks; in 2010 there was an outbreak of norovirus in Mississippi with 11 cases. HuNoV-contaminated seafood and seafood products may result in severe economic losses to the seafood industry due to product recalls, harvest area closures, and loss of consumer confidence. Research with human norovirus strains has been hampered by the inability to propagate the virus in vitro. Thus, survival studies of human norovirus must rely on suitable surrogates. Recently, murine norovirus (strain MNV-1), a virus that can be propagated in vitro has been identified. Classified as a genogroup V virus, MNV-1 has more biochemical, pathological, genetic, and morphological similarities to human noroviruses than other surrogates. Currently, chlorine-based sanitizers are widely used in the food industry as the primary decontamination method for pathogen removal. However, it has been demonstrated that these sanitizers are not effective in removing human norovirus. Moreover, noroviruses can become internalized in food. Chemical sanitizers may reduce the viruses at the surface level of foods, but not those that have been internalized. The FDA has approved doses of up to 5.5 kGy to control food-borne pathogens in seafood. X-ray irradiation, within the approved doses, has been approved to be a very effective against bacterial pathogens including Vibrio parahaemolyticus and Vibrio vulnificus, E. coli O157:H7, L. monocytogenes, Salmonella enteric, Shigella, Cronobacter species and spoilage bacteria. However, whether this dose range effectively inactivates food-borne viruses is not reported yet. We are proposing the use of X-ray doses (1.0, 2.0, 3.0, 4.0 and 5.0 kGy) to inactivate a human norovirus surrogate (murine norovirus 1(MNV-1).

Project Results/Outcomes

In progress

Project Impacts/Benefits

Expected outcomes include the identification of effective interventions to control norovirus on raw seafood products. The intervention will protect public health by significantly reducing the prevalence of viral pathogens and provide consumers and the seafood industry with high-quality and safer seafood products. This would also reduce the public distrust and increase consumers' confidence in raw seafood safety.

Project Deliverables

None

Graphics

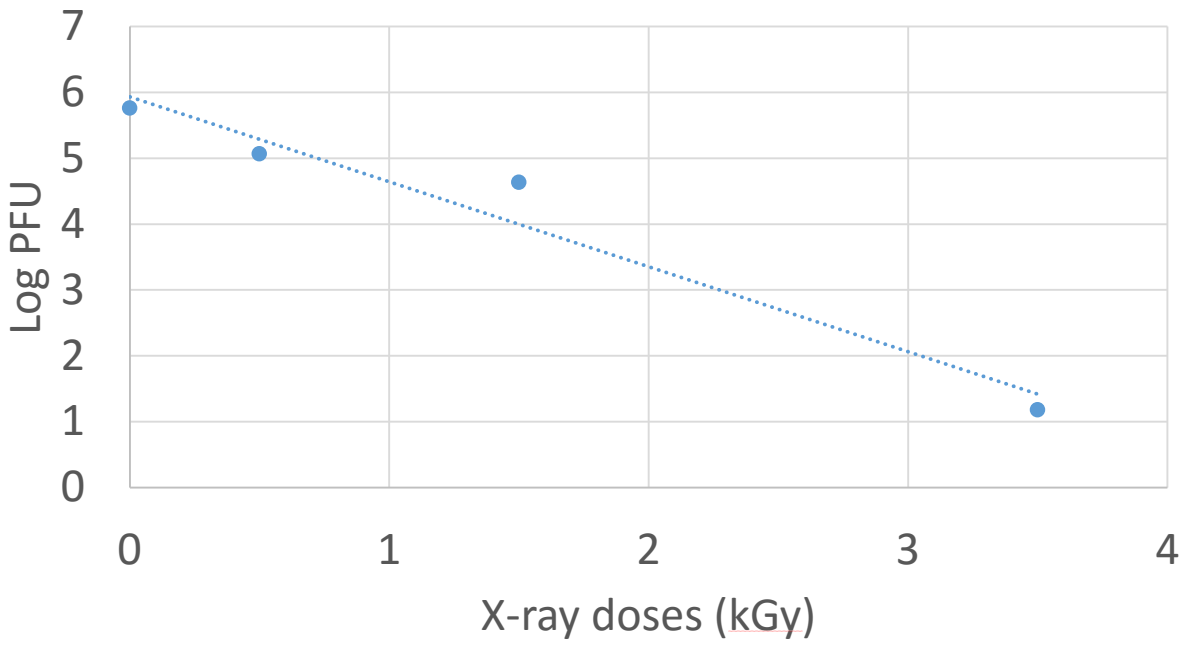

Fig. 1. Reduction of MNV-1 PBS stock solution by X-ray irradiation

Attached Refereed Journal Publications in Separate Files

None