

Novel X-Ray Technology for Reducing Vibrios in Oysters

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Raw oysters can serve as vehicles for many foodborne pathogenic microorganisms including Vibrios (*V. parahaemolyticus* and *V. vulnificus*). *Vibrio parahaemolyticus* is a gram-negative, halophilic bacterium that may cause gastroenteritis, vomiting, diarrhea, headache, nausea, and it is the leading cause of foodborne illness associated with the consumption of raw oysters. It occurs naturally in US waters where the majority of the nation's oysters are harvested. In 1998, the largest *V. parahaemolyticus* outbreak in the US involved 416 cases and was linked to consumption of raw oysters. In 2006, an outbreak of 177 *V. parahaemolyticus* infections linked to raw oyster consumption was reported and involved 3 hospitalizations. *Vibrio vulnificus* is also a gram-negative bacterium which occurs naturally in warm estuarine environments such as the Gulf Coast water where the majority of US oysters are harvested. *Vibrio vulnificus* has the highest fatality rate (~50%) among foodborne pathogens in the United States. The CDC estimates 47 foodborne illnesses of *V. vulnificus* yearly in the US with 18 deaths. Several post-harvest techniques have been proposed and some approved to reduce Vibrios in live oysters. These techniques include high or low temperatures, vacuum packaging, UV, electrolyzed water, or high-pressure treatments. Some of these techniques have low log reduction on Vibrios and/or kill oysters. Therefore, to reduce the dangers of consuming raw oysters, highly effective technologies are needed to meet consumers' demands and to be suitable for the oyster industry. The US Food and Drug Administration, has approved ionizing radiation for many foods including seafood. Three types of radiation source are currently permitted for food irradiation processing. (i) The radionuclides Cobalt-60 or Cesium-137. (ii) Electron beam (bremsstrahlung) generated by a machine at maximum energy of 10 million electron volts (MeV). (iii) X-rays generated by a machine at a maximum energy of 5 MeV. X-ray is one of the most effective technologies for controlling Vibrios in oysters. More than one million cells per gram of *V. parahaemolyticus* and *V. vulnificus* were reduced in oysters after treatment with 3-5 kGy X-ray. In addition, X-ray treatment did not kill the live oysters even at the highest dose (5.0 kGy).