

**AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
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TITLE: Optimization of Depuration for Eliminating *Vibrio parahaemolyticus* from Oysters

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SUMMARY

Vibrio parahaemolyticus is a human pathogen occurring naturally in the marine environments and frequently detected in molluscan shellfish, particularly oysters. Numerous outbreaks of *Vibrio parahaemolyticus* infection resulted in acute human gastroenteritis with symptoms of nausea, vomiting, abdominal cramps, and diarrhea have been linked to consumption of raw oysters in the U.S. Infection of *V. parahaemolyticus* can also lead to development of septicemia, a life-threatening condition, in people having underlying medical conditions such as liver diseases or immune disorders. The U.S. Centers for Disease Control and Prevention (CDC) estimated that 45,000 cases of *V. parahaemolyticus* infection occur each year in the U.S.

We recently developed a refrigerated seawater (7-12.5°C) depuration process capable of decreasing *V. parahaemolyticus* in raw oysters by greater than 99.9% (>3.0 log MPN/g) without adverse effects on oysters. This project investigated influence of pH change and oyster to seawater ratio on the efficacy of depuration for decontaminating *V. parahaemolyticus* in raw oysters. The overall goal of this study is to generate new knowledge for improving the efficacy of depuration to allow the shellfish industry to produce safe oysters for raw consumption.

OBJECTIVES

Determine effects of pH value of seawater and oyster to seawater ratio on depuration for reducing *Vibrio parahaemolyticus* in raw oysters.

PROCEDURES

Effects of pH value of seawater on depuration for reducing *V. parahaemolyticus* in oysters were conducted with freshly harvested Pacific oysters inoculated with *V. parahaemolyticus* to a level of 10^{4-5} cells/gram. Inoculated oysters were depurated in a re-circulation system using artificial seawater of pH 5.5, 7.0 or 8.3 at 20 or 12.5°C for up to 5 days. Effects of oyster to seawater

ratio on depuration for decontaminating *V. parahaemolyticus* in raw oysters were investigated using oyster to seawater ratios ranging from 1.0 to 2.0 liter of seawater per oyster. Populations of *V. parahaemolyticus* in oysters during depuration were analyzed every 24 hours using a three-tube most probable number (MPN) method described in the Food and Drug Administration Bacteriological Analytical Manual.

SIGNIFICANT ACCOMPLISHMENTS

Depuration of oysters in artificial seawater of pH 5.5, 7.0 or 8.3 at 20°C for 5 days resulted in 2.0, 2.0 or 2.8 log MPN/g reductions of *V. parahaemolyticus*. Greater reductions of *V. parahaemolyticus* in oysters were observed after 5 days of depuration at 12.5°C with artificial seawater of pH 8.3 (3.5 log MPN/g) and pH 7.0 (2.9 log MPN/g) but not of pH 5.5 (2.1 log MPN/g). The efficacy of depuration in reducing *V. parahaemolyticus* in oysters was enhanced by lowering water temperature to 12.5°C but reduced by decreasing pH of seawater.

Study of effects of oyster to water ratio (40 oysters in 40, 60, or 80L of water) with artificial seawater of pH 8.3 at 12.5°C revealed that depuration of 40 oysters with 80L of artificial seawater at 12.5°C could achieve >3.52 log MPN/g reductions of *V. parahaemolyticus* in oysters after four days of process. This study improved the efficacy of depuration in reducing *V. parahaemolyticus* contamination in the Pacific oysters. This controlled depuration may be applied as a post-harvest process to produce safe oysters for raw consumption.

BENEFITS & IMPACT

Contamination of *V. parahaemolyticus* in oysters is a public health concern. The U.S. produces more than 27 million pounds of oysters each year with most of them being sold and consumed raw. It is estimated that 20 million Americans eat raw shellfish, making raw and undercooked shellfish the biggest seafood hazard in the U.S. Reducing *V. parahaemolyticus* infection associated with raw oyster consumption has a significant impact on oyster growers, retailers, and consumers. This project investigated factors affecting efficacy of depuration for reducing *V. parahaemolyticus* levels in oysters and generated new knowledge for development of an optimal depuration process for commercial application to allow the shellfish industry to produce safe oysters for raw consumption and reduce *V. parahaemolyticus* infection associated with oyster consumption. The oyster industry and consumers both benefit from this study.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM

No additional funding has been received for this project.

FUTURE FUNDING POSSIBILITIES

Based on findings from this study, a proposal will be developed and submitted to relevant funding opportunity to study this controlled depuration for commercial application by the shellfish industry.