United States Department of Agriculture
Agricultural Research Service

EASTERN REGIONAL RESEARCH CENTER FACT SHEET

Microbial Safety of Seafoods

Program Background

The Microbial Safety of Aquaculture Products Center of Excellence was established on the campus of Delaware State University, Dover, DE, in 1999, as part of the USDA, Agricultural Research Service's Microbial Food Safety Research Unit. Centers of Excellence are partnerships between the USDA and colleges or universities, and are intended to foster complementary research on problems of National and regional concern and to enhance cooperative research at participating schools.

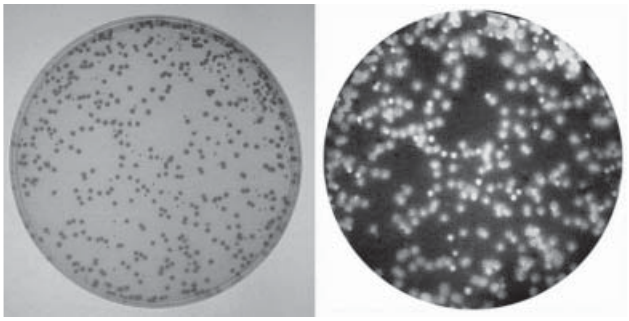
One of the most pressing problems related to shellfish safety is the contamination of oysters, clams and mussels with enteric viruses and bacterial pathogens. Among those microorganisms most associated with shellfish-related illnesses are hepatitis A virus, norovirus (previously called Norwalk-like viruses), and bacteria of the genus *Vibrio*. The overall mission of the laboratory is to develop rapid, cost effective, and practical methods to detect these microorganisms in fish and shellfish and to evaluate processing strategies to eliminate such pathogens. Information and methods are provided to health and regulatory agencies.

Research Objectives

The Seafood Safety Research Program is focusing its resources on four main objectives designed to enhance the safety of aquaculture products, to: a) continue to develop rapid, enzyme-based assays to detect bacterial pathogens in aquaculture products; b) identify inhibitors to molecular methods and develop real-time molecular methods to detect and quantify enteric viruses in shellfish tissues; c) investigate physical and chemical parameters influencing the efficiency of high hydrostatic pressure inactivation of hepatitis A virus, norovirus, and surrogate viruses; and d) investigate the mechanisms of enteric virus persistence within live shellfish. We are also participating in a volunteer study to determine the effectiveness of high pressure processing to inactivate human noroviruses in shellfish.

Impact

As requested by industry, state and Federal regulatory agencies, we developed improved bacterial and viral testing methods and shellfish processing strategies to enhance shellfish safety. The Centers for Disease Control and Prevention (CDC) have utilized our virus extraction procedure for shellfish in training courses offered to State Health Department personnel for the past 2 years. This method is also being evaluated for use as a potential standard method by the Canadian Food Inspection Agency, which has enlisted 10 laboratories to participate in a validation. Our research to identify novel enzymes in *Vibrio* species resulted in the development of a rapid, inexpensive, and simple assay to quantify total vibrios in shellfish, seawater, and aquaculture settings. Known as the colony overlay procedure for peptidases (COPP assay), this method is being evaluated by Rutgers University on oysters and seawater obtained from the Delaware Bay, by the Canadian Food Inspection Service for process verification and in their shellfish monitoring program, and was recommended by the FDA for use in a retail shellfish market study. The method is also being evaluated by researchers in Florida to determine if it can detect potential *Vibrio* diseases of corals and in Hawaii for total *Vibrio* enumeration in environmental samples. Finally, we showed that high pressure processing effectively inactivates hepatitis A and norovirus surrogates in shellfish. We are currently participating in a pivotal study to determine the effectiveness of high pressure processing to inactivate human noroviruses using volunteers. If successful, this will be the first non-thermal processing strategy to inactivate norovirus contamination in shellfish.



Bacterial colonies from an oyster homogenate grown on an agar plate (left) and fluorescent foci (Vibrionaceae) on the corresponding COPP overlay (right).

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Methods Development - Aquaculture

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