New research study to shed light on emerging seaborne pathogen

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A new research study at the University of Delaware seeks to determine why *Vibrio parahaemolyticus*, a microorganism that lives in seawater and is related to the bacterium that causes cholera, is expanding its range and virulence.

V. parahaemolyticus is a leading cause of seafood-borne illness worldwide, most frequently associated with the consumption of raw or undercooked seafood, particularly oysters and other mollusks, and crabs. Victims typically suffer from diarrhea, vomiting, fever and chills for a few days, although the infection can be fatal in those with weakened immune systems.

"This organism has been around for a long time," says Michelle Parent, assistant professor of medical technology at the University of Delaware and a co-investigator on the study. "However, only recently, in the past decade, has a new, more virulent isolate become more prevalent around the globe."

In North America, *Vibrio parahaemolyticus* is considered an "emerging pathogen." An estimated 4,500 cases of infection occur each year in the United States, according to the Centers for Disease Control. However, the agency suggests the number likely is much higher because labs rarely use the medium necessary to identify the organism, and cases go unreported.

"*Vibrio parahaemolyticus* usually causes a gastrointestinal infection that lasts two to three days, although individuals with compromised immune systems who work around seawater and get infected from a cut or open wound can die within a day," Parent says.

"This organism grows super-fast," Parent explains. "It has a replication time of six to nine minutes, which is very quick compared to other microbes."

The ultimate aim of the University of Delaware study, which is funded by a $400,000 food biosafety grant from the U.S. Department of Agriculture (USDA), is to home in on this emerging pathogen's virulence genes and determine how the organism overcomes its victim's immune system -- information that can then be used to combat, detect and prevent infection.

The aquaculture industry loses millions of dollars each year due to the contamination of oyster beds with *V. parahaemolyticus* during the summer months. Thus, providing oyster farmers with an agent to treat the oysters is an important overall goal and potential future direction of the research, Parent says.

Working with Parent on the project are E. Fidelma Boyd, assistant professor of biological sciences at the University of Delaware, and collaborator Gary Richards, a research microbiologist at the USDA's Agricultural Research Service in Dover, Del.

"*Vibrio parahaemolyticus* is most prevalent in the warmer summer months, especially in the U.S. Gulf Coast region where it occurs in high numbers," Boyd, a native of Ireland, says.

"In the past decade, the organism's geographic distribution has been extended into more northerly climes, in particular, the Pacific Northwest, most likely due to global warming. Thus, the occurrence and prevalence of the organism is likely to continue to expand," Boyd notes.

An oyster filters its food from the seawater in which it lives, ingesting not only tiny plankton but whatever else may be present in the water, including harmful bacteria such as *V. parahaemolyticus*. Thus, when a person consumes a raw oyster contaminated with the organism, they become infected. (Thoroughly cooking the seafood can prevent infection.)

The researchers want to determine what happens

once *V. parahaemolyticus* attaches to a host's cells and begins multiplying.

Through a series of experiments using various infectious doses of the organism, the scientists will explore what happens when a cell is infected, and what immune response is required to eliminate infection.

"Something is happening to allow this organism to predominate," Parent says. "What makes it so powerful? Does it have some advantage in the environment?"

"We want to determine if the bacterium has acquired new genes to make it more virulent, allowing it to survive better in the aquatic environment and/or in the human gut," Boyd adds.

In a recent study published in *BMC Microbiology*, Boyd, Parent and their co-authors show using genomic analysis that this new highly virulent strain has acquired large pieces of DNA, which may give the bacterium a major advantage from an evolutionary point of view.

"Using molecular genetic approaches, we will delete some of these genes in the bacterium and determine how well the organism can survive and grow," Boyd notes.

Source: University of Delaware