Scientists pry new information from disease-causing, shellfish-borne bacterium

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Researchers at UT Southwestern Medical Center have uncovered a key weapon in the molecular arsenal the infectious bacterium *Vibrio parahaemolyticus* (*V. para*) uses to kill cells and cause food poisoning in its human host.

Dr. Kim Orth, associate professor of molecular biology at UT Southwestern, said the new research on the ocean-dwelling bacterium is leading to greater insights into how it causes illness in humans while also providing a potential novel scientific tool for studying general cell biology in the laboratory. Dr. Orth is senior author of the study, which appears in the Aug. 19 issue of *Science Express*, the advance online version of the journal *Science*.

Dr. Orth and her team found that the bacterial molecule VPA0450 plucks a group of atoms called a phosphate from a larger molecule in a host cell that is critical to holding the cell together. Without that phosphate, the host-cell membrane fails. The cell loses integrity and is efficiently destroyed during infection.

"From a microbiology point of view, understanding how VPA0450 manipulates a host cell is critical to understanding how *V. para* causes disease," said Chris Broberg, a UT Southwestern student in the molecular microbiology graduate program and lead author of the study.

Dr. Orth and her colleagues previously identified two other Vibrio proteins called VopQ and VopS, which also attack host cells via separate

mechanisms. She said the new findings reinforce the notion that *V. para* kills a host cell through the combined efforts of several so-called effector proteins working together rather than through the actions of a single protein.

"In order to understand better the disease this bacterium causes, we need to characterize each effector's activity, then determine how they work in concert," Dr. Orth said. "This latest paper puts our field closer to this goal.

"The fact that this important study was led by one of our graduate students attests to UT Southwestern's highly successful model of training future scientists."

Most people become infected by V. para by eating raw or undercooked shellfish, particularly oysters, according to the Centers for Disease Control and Prevention. The organism also can cause an infection in the skin when an open wound is exposed to warm sea water.

Dr. Orth's research on *V. para* proteins has potential applications in other areas of cell biology. The particular phosphate that VPA0450 removes also is important to other host-cell proteins that control certain communication signals within and between cells, signals related to how cells grow and move, as well as how they maintain their structural integrity. As such, exploiting VPA0450's unique abilities could prove to be a useful research tool.

"Scientists have the ability to manipulate many cell-signaling pathways," Dr. Orth said. "VPA0450 could be used as a valuable tool to remove this key phosphate to change membrane signaling in a cell model system, which would then allow us to study these pathways in more detail."