

## Rainfall strongly affects infectious *Vibrio* bacteria in Ala Wai Canal

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**Source:** University of Hawaii at Manoa

**Summary:** In the Ala Wai Canal in Waikiki, Hawai'i, the abundance of *Vibrio vulnificus*, an infectious bacterium, is strongly influenced by the amount of rainfall in the surrounding areas, according to a recently published study.

### FULL STORY

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In the Ala Wai Canal in Waikiki, Hawai'i, the abundance of *Vibrio vulnificus*, an infectious bacterium, is strongly influenced by the amount of rainfall in the surrounding areas, according to a recently published study by oceanographers at the University of Hawai'i (UH) at Mānoa and Hawai'i Pacific University (HPU).

Study authors Olivia Nigro, then a graduate student in the oceanography at UHM and now an assistant professor at HPU, and Grieg Steward, professor in the UHM School of Ocean and Earth Science and Technology (SOEST), first assessed *Vibrio* in 2006 when Oliver Johnson died from a *V. vulnificus* infection after having cuts and scrapes exposed to Ala Wai Harbor water.

"His exposure occurred after many days of heavy rainfall, which, given our results, suggests this may have been an exacerbating factor," said Steward. "At the time, we realized there was almost no data on the ecology of *V. vulnificus* in the canal, or in Hawai'i generally, and remarkably, very little in tropical waters anywhere."

After a quick pilot study in 2006 that showed the bacteria are present in high, but not unexpected numbers, the team geared up for a year-long study in 2008-2009 with better methods to understand the variability in abundance over a seasonal cycle.

At higher latitudes, the abundance of *V. vulnificus* shows a very strong seasonal cycle -- nearly disappearing in winter when temperatures are cold. In Hawai'i, temperatures are warm year-round, so freshwater input becomes a more important control.

"*V. vulnificus* occurs naturally in warm, brackish waters," said Nigro. "So we expect to find this bacterium anywhere that temperatures are warm and freshwater and seawater mix in about equal proportions. When conditions are right, the Ala Wai Canal can be a great incubator for this bacterium!"

The researchers observed that rainfall has a variable effect depending on the amount of precipitation.

"Too little rainfall means much of the canal is saltier than optimum for *V. vulnificus* growth, too much rainfall and the canal is fresher than the bacterium likes," said Nigro. "We also found that, because of the flushing effect of intense rainfall, the highest abundance of *V. vulnificus* shifted from within the canal out into the harbor."

They observed the highest canal-wide average abundances, among the highest recorded anywhere, during a time of modest rainfall, moderate salinities and a moderate flushing of the canal.

The researchers noted that, although rainfall is more frequent in winter on average, significant rainfall can also occur in summer, so spikes in *V. Vulnificus* can be a problem any time of year. This makes it challenging to predict precisely when and where there will be high concentrations of this pathogen. However, based on a few variables -- rainfall and resulting salinity and flushing of the canal -- the relative risk of exposure to this pathogen could be predicted as an average for the system.

With additional years of data to better understand how *V. vulnificus* varies in space and time, it may be possible to provide real-time predictions of when and where the bacterium is likely to be at unusually high concentrations, which is one component in assessing the risk of infection.

"Although *V. vulnificus* can cause serious or even lethal infections, it usually only becomes a problem for individuals with underlying medical issues," said Steward. "So people should not panic about incidental exposure to canal water. But it is wise to wash off with soap and water after exposure and one should avoid exposing open wounds to canal water, especially if one is immunocompromised."

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### Story Source:

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### Journal Reference:

1. Olivia D. Nigro, La'Toya I. James-Davis, Eric Heinen De Carlo, Yuan-Hui Li, Grieg F. Steward. **Variable freshwater influences on the abundance of *Vibrio vulnificus* in a tropical urban estuary.** *Applied and Environmental Microbiology*, 2022; DOI: 10.1128/AEM.01884-21

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