ID: W2752405466

TITLE: Remote sensing measurements of sea surface temperature as an indicator of Vibrio parahaemolyticus in oyster meat and human illnesses

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ABSTRACT:

Vibrio parahaemolyticus (Vp) is a naturally occurring bacterium found in marine environments worldwide. It can cause gastrointestinal illness in humans, primarily through raw oyster consumption. Water temperatures, and potentially other environmental factors, play an important role in the growth and proliferation of Vp in the environment. Quantifying the relationships between environmental variables and indicators or incidence of Vp illness is valuable for public health surveillance to inform and enable suitable preventative measures. This study aimed to assess the relationship between environmental parameters and Vp in British Columbia (BC), Canada.The study used Vp counts in oyster meat from 2002-2015 and laboratory confirmed Vp illnesses from 2011-2015 for the province of BC. The data were matched to environmental parameters from publicly available sources, including remote sensing measurements of nighttime sea surface temperature (SST) obtained from satellite readings at a spatial resolution of 1 km. Using three separate models, this paper assessed the relationship between (1) daily SST and Vp counts in oyster meat, (2) weekly mean Vp counts in oysters and weekly Vp illnesses, and (3) weekly mean SST and weekly Vp illnesses. The effects of salinity and chlorophyll a were also evaluated. Linear regression was used to quantify the relationship between SST and Vp, and piecewise regression was used to identify SST thresholds of concern.A total of 2327 oyster samples and 293 laboratory confirmed illnesses were included. In model 1, both SST and salinity were significant predictors of log(Vp) counts in oyster meat. In model 2, the mean log(Vp) count in oyster meat was a significant predictor of Vp illnesses. In model 3, weekly mean SST was a significant predictor of weekly Vp illnesses. The piecewise regression models identified a SST threshold of approximately 14^oC for both model 1 and 3, indicating increased risk of Vp in oyster meat and Vp illnesses at higher temperatures.Monitoring of SST, particularly through readily accessible remote sensing data, could serve as a warning signal for Vp and help inform the introduction and cessation of preventative or control measures.