Indicators of the Occurrence of Vibrio in the Winyah Bay, SC Estuary

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Concept

Field sampling for *Vibrio* - This project

PRISM2 model - Prior project

Forecast future *Vibrio* in the study area - This project
Research Objectives

• Quantifying the distribution of *Vibrio vulnificus* and *Vibrio parahaemolyticus* in the Waccamaw River/Winyah Bay estuary

• Correlate *Vibrio* occurrence with environmental parameters
  - Especially salinity / conductivity

• Potential trends of *Vibrio* for the years 2055-2068 under future sea level and streamflow
Methods

• Monthly sampling in the Waccamaw River/Winyah Bay
  – Surface/bottom water
  – Field parameters measured
  – April – October 2012
  – Special Sandy sample

• Filter and incubate
  – CHROMagar
  – Focus on *V. vulnificus* and *V. parahaemolyticus*

• Statistics
  – Correlations of Vibrio spp with temperature, conductivity, and turbidity
  – Regression models

• Couple with PRISM2
Methods

• PRISM2 overview
  – Developed by USGS and ADMi
  – Neural network model
  – Uses streamflow, sea level, and tide stage
  – Predict conductivity in the Waccamaw River and Intracoastal Waterway

• PRISM2
  – Trained using historic data
  – HSPF model predictions of future streamflow
  – Used 1, 2, 3 ft. sea level rise
  – Predict future conductivity

• This project
  – Predict impact on Vibrio distribution
Results

• *Vibrio* found at all sites
  – Highest concentrations within known optimal salinity range

• PRISM2 predicts conductivity increases
  – Sea level is stronger driver of salinity trends than river flow
  – 90th percentile conductivities 2X – 15X depending on location and SLR
  – Peaks more frequent and longer duration

• *V. vulnificus*
  – More common in upriver sites
  – High concentrations more frequent and longer duration
  – Depends on SLR
Implications

• Greater opportunity for exposure
  – Geographic range increase
  – Temporal expansion

• Exposure risk based on occurrence of optimal conductivity range
  – Increase as much as 36X
  – Wound infections only

• Other factors
  – Temperature not included in this study
  – Optimal range is 15-30° C → *V. vulnificus*
  – Estuarine water is warming
  – Expect more days per year in range
Summary and conclusions

1) *Vibrio* spp. occur throughout the Waccamaw River/Winyah Bay estuary
   1) Even fresh water reaches

2) Salinity predicted to rise in the future
   1) Higher salinities, greater frequency, and longer duration of conditions that favor *Vibrio* growth

3) Potentially significant public health implications

4) Future work:
   1) Look at virulence
   2) Integrate temperature into the model
Questions?

**PRISM2 report**


**Deeb thesis**