

Management of *Vibrio* *parahaemolyticus*

What we know, what we don't know, and how it
impacts State control strategies

M. Lizzie Evans, MS
Laboratory Evaluation Officer
Center for Food Safety and Applied Nutrition



Overview

- What we know
- What we don't know
- What we are doing about it (regulatory)
- How will this impact States?

What we know

- *Vibrio parahaemolyticus* (*Vp*) is naturally occurring
- Estuarine bacteria
- Require salt to grow
- Normal habitat includes shellfish
- Causes gastroenteritis, and rarely septicemia

What we know

- Associated with molluscan shellfish and crustaceans
 - mostly raw oysters and raw clams
- Shellfish Associated Outbreaks
 - Illnesses: occur in ALL regions of the country



What we know

- Recent illnesses/outbreaks:
 - PNW
 - North East and Mid Atlantic regions
- Illnesses continue to occur in all regions and rate increases
- Typically occurs during warm weather months harvesting, May-September. (Seeing illness increases in April and September)
- Not limited to U.S. shellfish: Canada, EU member states

What we know

- Not ALL *Vibrio parahaemolyticus* (*V.p.*) are created equal....
 - Pathogenicity varies
- Virulence markers are not entirely reliable!
 - *tdh/trh* (most reliable tool we have at this time)
 - Serotypes
 - Type III secretion system
 - Genetic markers for clinical and environmental strains

What we know

- 2012 outbreak strain possessed *tdh* and *trh*
- Serotype O₄:K₁₂ or O₄:K un-typeable (Kut)
- Predominantly found in Pacific NW prior to 2012
 - Infectious at lower doses than strains typically found on the East Coast
- Currently mitigation of risk consists of
 - Harvest controls (including T/T) in State *V.p.* Control Plans
 - Post-harvest processing (PHP)

What we know

- The use of ice is not a new or novel control measure.
- Several states have established icing shellstock onboard harvest vessels and at landing as a temperature control measure with documented success in controlling post harvest growth and doubling times.
- Icing shellstock or slurry dips for the purpose of temperature control under a State's Vibrio Control Plan should be considered an acceptable practice.

Temperature specific Vp Growth rates and Doubling times

| Oyster Temperature (degree F) | Growth rate (logs/hr) | doubling time (hrs) | Oyster Temperature (degree F) | Growth rate (logs/hr) | doubling time (hrs) |
|-------------------------------|-----------------------|---------------------|-------------------------------|-----------------------|---------------------|
| 50 | 0.008 | 35.8 | | | |
| 51 | 0.011 | 28.4 | 76 | 0.147 | 2.05 |
| 52 | 0.013 | 23.1 | 77 | 0.156 | 1.93 |
| 53 | 0.016 | 19.2 | 78 | 0.165 | 1.83 |
| 54 | 0.019 | 16.1 | 79 | 0.174 | 1.73 |
| 55 | 0.022 | 13.8 | 80 | 0.183 | 1.64 |
| 56 | 0.025 | 11.9 | 81 | 0.193 | 1.56 |
| 57 | 0.029 | 10.4 | 82 | 0.203 | 1.48 |
| 58 | 0.033 | 9.14 | 83 | 0.213 | 1.41 |
| 59 | 0.037 | 8.11 | 84 | 0.224 | 1.34 |
| 60 | 0.042 | 7.24 | 85 | 0.235 | 1.28 |
| 61 | 0.046 | 6.50 | 86 | 0.246 | 1.23 |
| 62 | 0.051 | 5.87 | 87 | 0.257 | 1.17 |
| 63 | 0.056 | 5.33 | 88 | 0.268 | 1.12 |
| 64 | 0.062 | 4.86 | 89 | 0.280 | 1.07 |
| 65 | 0.068 | 4.45 | 90 | 0.292 | 1.03 |
| 66 | 0.074 | 4.09 | 91 | 0.304 | 0.99 |
| 67 | 0.080 | 3.77 | 92 | 0.317 | 0.95 |
| 68 | 0.086 | 3.49 | 93 | 0.330 | 0.91 |
| 69 | 0.093 | 3.24 | 94 | 0.343 | 0.88 |
| 70 | 0.100 | 3.01 | 95 | 0.356 | 0.85 |
| 71 | 0.107 | 2.81 | 96 | 0.370 | 0.81 |
| 72 | 0.115 | 2.63 | 97 | 0.383 | 0.79 |
| 73 | 0.122 | 2.46 | 98 | 0.397 | 0.76 |
| 74 | 0.130 | 2.31 | 99 | 0.412 | 0.73 |
| 75 | 0.139 | 2.17 | 100 | 0.426 | 0.71 |

What we know

- Controlling Post harvest growth is an essential part of illness reduction
- The doubling rate of V_p is extremely rapid, and reduction of temperature is an effective control strategy.

What we DON'T know

- Will the pathogenic Vp strains persist?
- What will this season hold?
- Will states continue to increase compliance rates with time/temperature controls and continue to implement new strategies?
- Will icing programs be developed in states as an innovative way to cool onboard or at landing and control post harvest growth to prevent illness.

What we DON'T know

- What are States currently using to determine risk?
- Is landing information being gathered and utilized to measure risk?
- Are states collecting data? If so, is the data just environmental and illness data or are states looking at Vp levels?

What are we doing about it?

- States:

- Perform risk assessments
 - Looking at epidemiologically linked cases
 - Looking at total and pathogenic levels
 - Determining water and air temperatures
 - Measuring salinities and historical trends
 - IMPLEMENTING POST HARVEST CONTROLS
- Every state requiring a Vibrio Risk Management Plan is evaluated annually.

What are we doing about it?

- States continued:
 - States have encouraged and implemented icing onboard or ice slurry dips at landing. Both have been successfully employed with no significant mortality of oysters (no significant differences between treated and untreated product in some studies).

What are we doing about it?

- States and FDA:
 - Data generated by FDA and State partners show the icing procedures will inhibit growth and proliferation of bacteria in addition to decreasing internal meat temperature (data will be discussed in another presentation).
 - Guidelines have been/are being developed for industry by States and FDA to streamline implementation of best practices

What are we doing about it?

- FDA:

- State evaluation conducted by Regional Shellfish Specialist.
- FDA's State assessment provides an understanding of compliance at the national level.
- FDA reports to the ISSC on states and industry measures to control the risk of Vibrio illness and the efficacy of the controls.
 - Dauphin Island assists, when they are able, in development and validation of temperature controls in conjunction with State efforts.

State Impact

- It remains the State's responsibility to ensure the safety and efficacy of approved procedure for temperature control.
- Before approving any system for temperature control, either onboard harvest vessels, at landings, or in processing plants, prospective systems for cooling should be evaluated by the state.
- Additionally, consultation with FDA Regional Shellfish Specialists or CFSAN is always available to States needing further guidance.

State impact

- What supports are in place for the personnel, money?
 - Will require enforcement and industry training and support.
 - Are there academic collaborators available?

Questions?



Policy

M. Lizzie Evans
melissa.evans@fda.hhs.gov



S.M.E.

Jessica Jones
jessica.jones@fda.hhs.gov