

Recommendations and Considerations Resulting from the *Vibrio parahaemolyticus* Control Workshop



December 4, 2015 - Courtenay, BC

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Vibrio parahaemolyticus Control Workshop

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Clara Hard, from Washington State Department of Health, kindly provided all training materials and documents associated with their *Vibrio parahaemolyticus* control program following the workshop (displayed in the appendices).

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Thank you to the following sponsors:



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Executive Summary

This report provides the recommendations and discussion arising from the *Vibrio parahaemolyticus* (*Vp*) Workshop which took place on December 4, 2015 in Courtenay, BC. Participants included representatives from the shellfish industry (BC Shellfish Growers Association), Health Canada, Department of Fisheries & Oceans, Canadian Food Inspection Agency, BC Centre for Disease Control, BC Ministry of Health, Island Health Authority, Vancouver Coastal Health Authority, BC Ministry of Agriculture and providers of materials and services to the shellfish industry (i.e. data loggers for temperatures and testing for *Vp*).

There was broad agreement that the *Vp* protocol in place at the time of the illness outbreak needs to be improved in order to be more effective and proactive without creating unnecessary barriers and costs to the shellfish industry. It was generally agreed that an improved risk management strategy would require close cooperation between the industry, from growers, processors, distributors, retail sales and restaurants, and the various levels of regulators and health authorities.

Participants recognized that there needed to be improvements made in assessing *Vp* risk, harvesting, transportation, illness tracking and reporting, temperature monitoring / triggers, communications, data transparency, tracking tools, compliance audits and enforcement at all stages from harvest to final sale. There was support for a mandatory training requirement for harvesters and processors of oysters intended for raw consumption during the high risk time of year.

A national *Vp* working group will be established to determine how best to achieve these goals, regulatory jurisdictional issues and implementation.

I. Introduction

This workshop was hosted and organized by the staff of the BC Centre for Disease Control and the BC Shellfish Growers Association in order to address concerns arising from the high number of *Vibrio parahaemolyticus* (*Vp*) illnesses attributed to the consumption of raw BC oysters beginning in the late spring of 2015. The early onset of *Vp* illnesses appears to have been the result of abnormally high water temperatures earlier in the year than expected.

The *Vp* illness outbreak and the large number of illnesses reported caught the shellfish industry, regulatory organizations, public health and other stakeholders by surprise. Although the industry was operating within the existing regulatory framework, it was ineffective in preventing the outbreak. New illnesses ceased when public health organizations banned the serving of raw oysters in restaurants. Subsequent requirements implemented by federal regulators to permit oysters intended for raw consumption to re-enter the market resulted in a considerable financial burden on the industry.

Unfortunately, the industry was not aware of the illnesses outbreak until it was too late to take any action. A lack of effective communication between industry, regulators, public health and others was an issue that was cited as contributing to the problem.

The objective of the workshop was to “develop a risk based approach to managing *Vibrio parahaemolyticus* in oysters for raw consumption that is inclusive of all sectors.”

II. Scientific and Technical Presentations

A number of presentations were made by participants who were experts in their respective fields in order to provide additional information that would be useful for the discussions to follow. Unfortunately the representative of the BC Restaurant Association, Ian Tostenson, was unable to attend to make his presentation and participate in the discussions due to transportation difficulties. Copies of the presentations outlined below are included in the Appendix of this report.

1. *Vibrio parahaemolyticus* Abundance and Variable Seasonality in the Environment; Enrico Buenaventura; Bureau of Microbial Hazards, Health Canada

The ecology of *Vibrio* in the environment reveals that *Vibrio* growth occurs with increasing seasonal temperatures and persists in sediment, reappearing seasonally and during winter resuspension events. Risk managers must evaluate their operations in terms of temperatures, 15°C is a starting point, but depending on the operation may need to be defined between 12°C and 19°C.

2. Microbiological Assessment of Shellfish – *Vibrio parahaemolyticus* MPN; Virendra Gohil, Senior Scientific Specialist, Microbiology; Maxxam

The Maxxam presentation discussed the analytical procedures that can be used to determine levels of *Vp* and explained how their company analyzes oyster samples along with the associated time frames. Future analytical techniques and issues were also presented which may shorten the time frames.

3. New *Vp* Control Plan in Washington (as of May 2015); Clara Hard, Shellfish Illness Coordinator, Office of Environmental Health and Safety; Washington Department of Health

Washington State has implemented a very detailed and comprehensive *Vibrio parahaemolyticus* Control Plan with growing area classification based on *Vp* illness history, mandatory *Vp* Harvest Plan for processors, monitoring temperatures at harvest sites, specified times to getting the oysters chilled to temperatures that will inhibit *Vp* growth and forms to record all of the requirements of the control plan. There is also a mandatory training requirement to ensure that the shellfish industry understands the requirements of the *Vp* Control Plan.

4. Temperature Tracing in Seafood and Other Industry Settings, Identifying Problem Distribution Points; Hilary Dovey, Dwayne Schmidt, Stan Meldrum; Precision Label, Ltd.

The presenters outlined the technical details of a number of the devices they can provide to the shellfish industry along with the potential benefits. This was useful in that it gave the participants insight regarding the current state of temperature monitoring options available for monitoring shellfish from the harvest sites to the retail outlets and restaurants.

III. Working Group Discussions and Recommendations

To facilitate discussion, participants were divided into six working groups. An effort was made to include representatives of each of the organizations invited to the workshop. Working groups were tasked to identify the key issues, which were then presented to all of the participants for consideration and further discussion. A summary of discussion points on the issues follow.

1. **Industry Plan** (the plan below was given to workshop participants prior to the meeting)
 - a. Education: the BCSGA will work with the applicable regulators to develop training for farmers and processors with a future goal of also educating other end users. Training needs to be mandatory for those wishing to harvest, distribute and sell oysters for the raw market during the *Vp* season.
 - b. Testing: The BCSGA accepts that Final Lot Testing as an interim measure is appropriate for the 2016 *Vp* season.
 - c. Communication: Industry and stakeholders will work on an improved communication program to assure timely flow of information.

Discussion points from the *Vp* working group at the workshop include:

- Industry shellfish processors must comply with the requirements of Appendix K of the federal Fish Inspection Regulations. Would be helpful if all shellfish processors could only buy shellfish (oysters for raw consumption) from harvesters with a plan. The plan could be similar to what is used in WA state (e.g., plan includes temperature control).
- An education model similar to what is used by WA State needs to be developed.
- More audits on farm sites and at delivery sites are required.

- The CFIA policy manual must be amended to reflect the changes to *Vp* risk management.
- Provincial plant inspections will be required for licensed shellfish processors who only distribute product that has previously passed through a federally registered shellfish processor.

2. Illness Triggers

- Illnesses should be reported to industry on a timely and consistent basis so they are informed of issues. The 2015 season was reactive, communication of illnesses was not timely enough for industry; needs to be more proactive.
- BC illnesses associated with BC oyster product should be reviewed alongside US (or international) illnesses associated with BC product.
- How to incorporate illness from other jurisdictions outside of BC.
- Immediate actions that normally occur are case investigation of illnesses, followed by advisories when numerous illnesses occur.
- Long term risk assessment to assign risk levels to harvest areas linked to illnesses over time.
- How to best use human illness to determine area specific response.
- Define the triggers for a public health response: number of cases / over specified period of time / in a space.
- Numbers of illnesses (incident rates) should be considered alongside of single illness (incident rate vs. illness trigger).
- Incorporating production date; distribution of product in jurisdictions- by harvest site, by processor, by restaurant in the context/analysis of illnesses.
- Single harvest area source associated with illness is useful information vs. multiple source harvest areas, this requires illness rate per harvest volume.

3. Temperature Triggers

One risk assessment based on one zone as in the WA model.

- When oyster meat or seawater temperatures reach 18 C degrees, conditions allow growth of *Vp*. Use this as a *Vp* risk management spike trigger.
- Validation and verification of temperature tracking.
- Standard protocol for temperature monitoring; temperature monitoring throughout distribution, verification performed at each stage of the chain: is temperature being controlled?
- Triggers are also affected by time: temperature determines time. Time temperature relationship, higher temperatures require faster cooling to get oysters under temperature control.

- Consensus of group that data Loggers for temperature should be used through-out food chain: YES - Harvest, Receiving, Processing, Distribution, First Destination
- Harvest areas: inlets vs. exposed plus depths – this may be the same location, but very different temperatures. A single location such as a bay or inlet can have more than one risk classification based on beach vs. suspended culture. Harvest areas may have microenvironments.

4. Communication

Communications to industry need to include human illness numbers as early as possible from public health

- Communications from industry need to inform public health of environmental issues such as increased temperatures, vibrio counts, volume, etc.
- How is information communicated and who wants it? For e.g., DFO communicates to all growers.
- Stakeholders need to identify to each other what information is needed and what information is available and what can be shared.
- Public communication should have standardized messaging and shared among agencies before release where possible.

5. Data Transparency

- What are Stakeholders Prepared to Do?
 - Share Illness Data
 - Temperature, *Vp* sampling
 - Volumes Harvested
 - Volumes Consumed
- Transparency from the highest level of regulator down to the harvester
- Illness Data:
 - Counts of cases: Health Authorities – BCCDC could make available - to processor / harvester / BCSGA the trend of *Vp* confirmed cases as they become available
 - In addition, it was suggested that, in order to facilitate communication of more specific illness data, DFO could send a letter to oyster producers asking for their voluntary participation in a registry of email / cell details. At the moment health authorities do not have a means to contact producers as their contact details are not public
- Temperature Monitoring and *Vp* Sampling:
 - Association will enact process
 - Who needs information and why?

- Collate for specific purpose
- Retail / restaurant / processor / trucking / harvesting all need temperature tracking
- When problems start should communicate issue (*Vp* illnesses occurring) back to the farm.
- Volume Harvested:
 - Industry and DFO have this information
 - A web portal for harvesters to log production onto
 - What do regulators want to know?
- Volumes Consumed:
 - Survey of voluntary records as done in WA
 - Restaurant sales reports
- Canadian Community Health Survey has nationwide consumption data.
- Who needs it? Why? When?

6. Tracking Tools

SQA – shellfish farms are verified with third party audit.

- Illness surveillance & shellfish tags:
 - Tracking with tags for illness surveillance is an issue to many
 - Can restaurants provide receipts with more information about the origin of the oysters eaten by customer?
 - Better management of tags at restaurant level is needed
 - It was suggested that a way to improve the interpretation of tag data would be if restaurants could keep better track of which oysters were served each day, for example by keeping the tags corresponding to oysters served a given day in one envelope
 - Could producers & processors bar code the tags?
- Temperature tracking tools:
 - Disposable, every shipment with visual for restaurant, but not auditable
 - Exterior box sensor not as good as interior of box sensor
 - Red colour on the temperature sensor means shipment is over temperature:
 - Educate restaurant, send it back if time / temperature limit is out of compliance.
 - Industry suggested that restaurants must send temperature loggers back to processor and if they don't comply then processor will refuse to send that restaurant further shipments (no temp data loggers = no more product.)
- We can track, get more data BUT there needs to be MORE enforcement.

- Shellfish Tags:
 - EHOs collect and share with BC CDC & CFIA – Processors
- When there are too many tags:
 - Can we limit the number going into a review, limit to more recent tags?
 - Can BC CDC triage the tags before sending forward to CFIA for review with the processor?
- Usefulness of temperature control tracking:
 - At Farms
 - At Processor
 - At Distribution
 - For illness surveillance
 - For management at farm / processor / restaurant / transport / distribution
 - Concurrent sampling through chain helpful
- Water Temperature Tracking:
 - Identify the start of season and end of season
 - *Vp* CFIA Indicator Sites: do not recommend going back to this as it lends industry a false sense of security about conditions at their harvest site
- Questions that should be asked during investigation:
 - Handling practices thru food chain
 - ID history of product
 - Who is the carrier of the product?
 - Issue with who does the inspection and their jurisdiction
 - Transport and delivery inspections are a problem area
 - Handling during the distribution activities is a problem
 - Need to spend more time on fewer investigations
 - Process audit questionnaire
 - Develop an audit questionnaire

National *Vp* Working Group: The consensus of the *Vibrio* workshop participants was to endorse the idea of a National *Vp* Working Group made up of key decision makers with representation from BCSGA, HC, CFIA, DFO, Ministry of Agriculture, BC CDC and Health Authorities (VCH).

IV. Recommendations

The *Vp* Control Workshop afternoon working group session identified many issues. These issues are a starting point for future discussions, and will need to be explored more fully to more clearly define the intent of a specific discussion point or recommendation. Summaries of recommendations from the six themed working groups are shown below.

Industry plan recommendations: to require shellfish harvesters to have an approved oyster harvesting plan and that shellfish processors must purchase oysters only from shellfish harvesters with a plan (under the mandate of Appendix K, which should be amended to include this); to develop training for shellfish harvesters; for audits at site of harvest, delivery, and provincial shellfish processing plants.

Illness trigger recommendations: Illnesses need to be communicated to industry; illnesses attributed to BC oysters that occur in the US and elsewhere need to be communicated to all; a system to assign illness incident rates to growing areas that includes volumes harvested should be developed; similar to growing areas, incident rates should include processors and restaurants implicated; illnesses need to be defined for public health response.

Temperature triggers recommendations: a temperature trigger should be used to implement a harvester risk management plan (18°C was suggested); temperatures should be tracked through-out the food chain, and use of data loggers is supported; however, temperature data tracking needs to be standardized, validated and verified.

Communication recommendations: Illnesses need to be communicated to industry; likewise industry needs to communicate environmental triggers to public health; all stakeholders need to determine how to share information with each other.

Data transparency recommendations: data should be transparently shared; prior to sharing data the different parties should agree on what type of data needed to be shared, for what purpose and should define who would need access to such data; web portals could facilitate recording of data.

Tracking tool recommendations: improved illness surveillance can be achieved with better management of tags at the restaurant, by reviewing tags before submitting for follow-up; temperature tracking can inform management practices (e.g., when over temp and shipments should be refused); water temperature tracking can inform *Vp* risk; investigation of issues can be improved by using standardized questionnaire.

Many of the recommendations of the working groups at this workshop have the potential to impact on various regulatory and health organizations. It will be necessary to confirm which level of government, federal, provincial or regional, has the regulatory mandate and authority to implement and enforce the specific requirements of an amended *Vp* control plan.

In addition to regulatory mandate and authority, there are resource implications arising from the recommendations for additional oversight, audits and enforcement. To properly implement an enhanced *Vp* control plan, there needs to be a commitment to the additional responsibilities and resource requirements from all stakeholders. These two issues, mandate for action and funding for implementation, will need to be determined by the National *Vp* Working Group.

Vibrio parahaemolyticus Control Workshop

Appendix A: List of Workshop Attendees

Last Name	First Name	Job Title	Organization	City	Prov	E-mail
Ash	Randy	Manager	Vancouver Coastal Health Authority	Vancouver	BC	randy.ash@vch.ca
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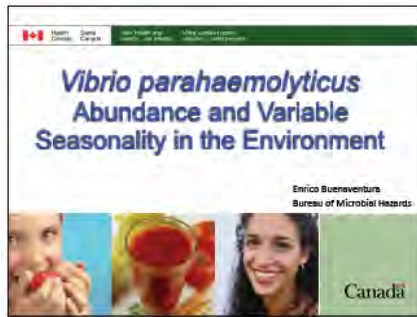
Vibrio parahaemolyticus Control Workshop

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Vibrio parahaemolyticus Control Workshop

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Appendix B: Vibrio parahaemolyticus - Abundance and Variable Seasonality in the Environment, Enrico Buenaventura, Health Canada



1

Unlike the toxigenic *Vibrio cholera*, which is associated with fecal contamination and poverty, *Vibrio parahaemolyticus* (Vp) is considered part of the autochthonous microflora in estuarine and coastal environments and thus NOT associated with fecal contamination. Moreover, Vp infections are associated with higher economic status.

- Undetectable in seawater at <10 C, detectable in sediments
- Life cycle in temperate zones
 - Overwinters in sediments
 - Phase release with zooplankton with increase water temp

2

Vibrio parahaemolyticus

Pathogenic strains

- assoc with tdn and/or trh
- pandemic O3:K6
- endemic O4:K12 (ST 36, PFGE indistinguishable O4:KUT)

Highly Motile

- Polar flagella
- Lateral flagella

Navigation -chemotaxis

Density

- Water 100 per mL (oligotrophic)
- Zooplankton upwards of 1,000,000,000 per gram (nutrient dense)

3

Vibrio parahaemolyticus

In areas where there are no geological barriers

- Possible zooplankton mediated oceanic transport
- Genetically similar strains in offshore planktons and estuaries spanning 1500 km
- Connects distant regions and habitats

4



5

Vibrio parahaemolyticus

Complex Life Cycle

Reservoir - areas of high substrate availability

- Biofilms
- Zooplanktons, phytoplanktons
- Gastro-intestinal tract of fish & invertebrates

Growth

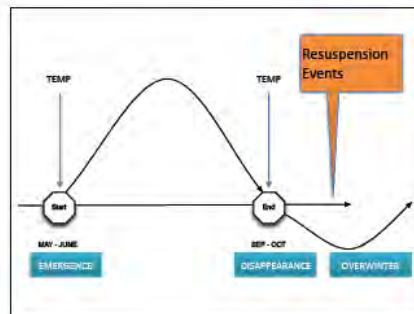
- Capable of very rapid growth
- Non-growth with periods of unbalanced growth

6

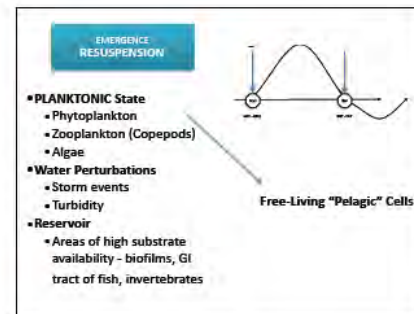
Scenario

Vibrio parahaemolyticus (Vp)
Abundance & Variable Seasonality

7




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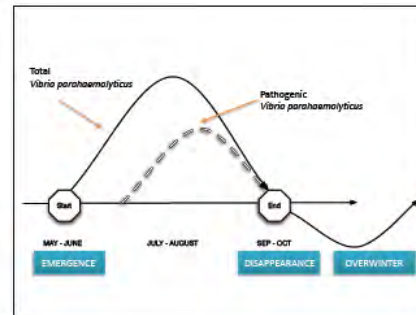
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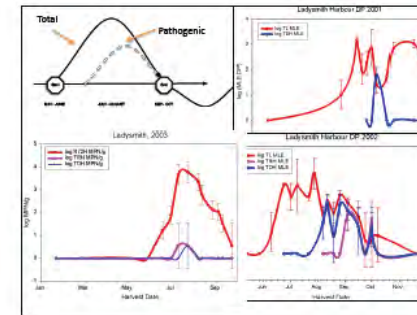
DISAPPEARANCE

- Sedimentation
- Predation
- Bloom Termination
 - Environmental
 - Vp Phages

19



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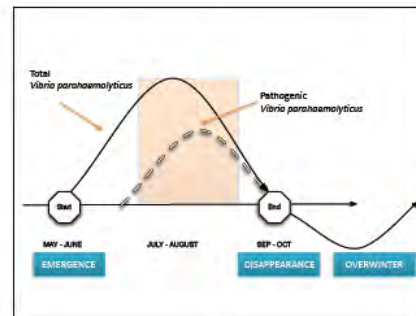
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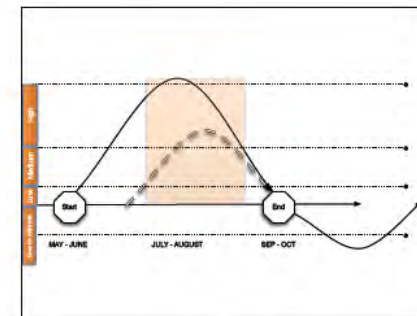
Vibrio Results

Sample Date	Site Name	Growing Area	Total Vp		Pathogenic Vp
			TUH MPN	TDH MPN	TRH MPN
7/6/2015	Rock Point	Dabob Bay	430	43	430
7/6/2015	Quilomee Bay	Quilomee Bay	9300	9.3	230
7/6/2015	Brimmon	Hood Canal 5	2500	4.1	23
7/6/2015	Beacon Point	Hood Canal 4	24000	0.36	930
7/6/2015	Hama Hama	Hood Canal 5	4300	0.36	43
7/6/2015	Union	Hood Canal 6	46000	<0.3	2300
7/7/2015	Somers Pt	Hood Canal 7	24000	<0.3	1200
7/7/2015	DeNotta's Beach	Hood Canal 9	7500	<0.3	23
7/6/2015	Chapman Cove	Oakland Bay	7500	9.3	93
7/5/2015	Pickering	Pickering Passage	46000	310	2300
7/7/2015	Mid-Hammond	Hammond Bay Inlet	>150000	43	46000
7/7/2015	Oyster Bay	Totten Inlet	24000	430	1500
7/7/2015	Skookum Inlet	Skookum Inlet	2300	93	230
7/7/2015	Samish Bay	Samish Bay	93	<0.3	43


22



23




24




Levels in Oysters

Vibrio parahaemolyticus

- Temperature
- Nutrients
- Free-living cells
- Planktonic association



25




Oysters

- Hyper accumulation
- Pathogen particle association

Zooplankton
1000000000 vp/g

Water column
200 vp/mL


26



Vp Levels in oysters

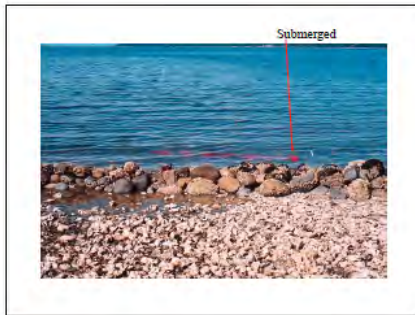
Bioaccumulation in the digestive diverticula (filter feeding)

Vp growth in the intravalvular fluid



28

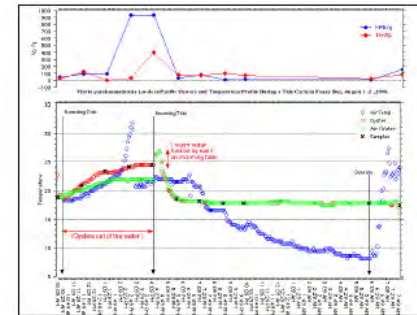
Vibrio parahaemolyticus Control Workshop



29



30



31

Appendix C: Microbiological Assessment of Shellfish – Vibrio parahaemolyticus MPN, Virendra Gohil, Maxxam

Microbiological Analysis of Shellfish – Vibrio parahaemolyticus MPN

Maxxam
A Bureau Veritas Group Company

Microbiological Analysis of Shellfish

Microbiological Analysis of Shellfish

Canadian Shellfish Sanitation Program

↓

Health Canada Method – MFLP-37

↓ ↑

BAM FDA – Chapter 9

Methods are available online
Maxxam is accredited under ISO 17025 for Health Canada Method MFLP-37

Maxxam
A Bureau Veritas Group Company

February 1, 2018 2

Microbiological Analysis of Shellfish

Microbiological Analysis of Shellfish

Day 0

- Sample preparation, Weighing and Preparation of dilutions
- Enrichment
A total of 9 tubes are inoculated per sample. If higher numbers are expected (e.g. in peak period) 12 tubes may be used

Maxxam
A Bureau Veritas Group Company

February 1, 2018 3

Microbiological Analysis of Shellfish

Microbiological Analysis of Shellfish

Day 1

- Streaking on selective agar plates for isolation from each tube
- Incubate plates

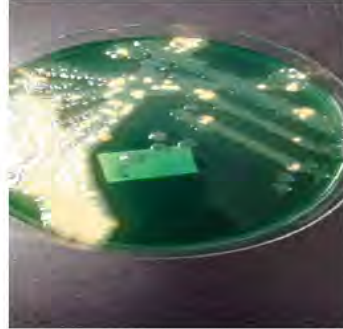
Maxxam
A Bureau Veritas Group Company

February 1, 2018 4

Microbiological Analysis of Shellfish

Microbiological Analysis of Shellfish

Day 2
1. Observe for typical colonies. If no typical colonies on any plates, results are finalized and reported
2. If Typical colonies are observed proceed for Confirmation tests



Microbiological Analysis of Shellfish

Microbiological Analysis of Shellfish

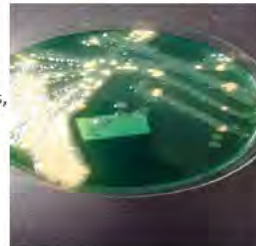
Day 3-6
Confirmation steps and reporting

- Results are reported as Most Probable Numbers (MPN)
- Derived from McCrady's Table by checking the MPN index of confirmed tubes

Microbiological Analysis of Shellfish

Current Options for TAT Reduction

- On Day 2 Presumptive results may be released. Presumptive counts are derived from all potential positive tubes under analysis. Confirmed results **cannot be greater** than Presumptive results
- Example of Presumptive result
(Green colour colony can be *Vibrio parahaemolyticus*, *Vibrio vulnificus*, *Vibrio mimicus*)
 - It may be possible to release all Presumptive counts on Day 2 and a decision can be made to release the lot



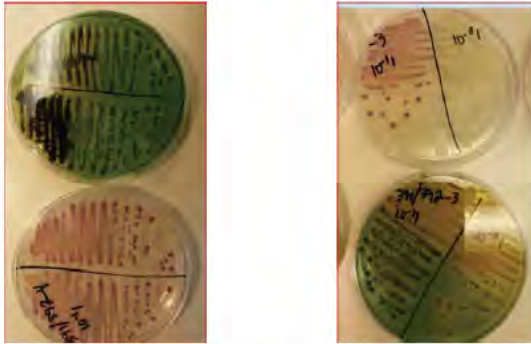
Microbiological Analysis of Shellfish

Future Options for TAT Reduction

- Adopting new Technology
 - Requires validation study
 - Acceptance of validation study by Regulatory bodies
- Near future
 - Use of Enzyme substrate based agars for Vibrio analysis– Chromogenic agars
 - Potential of accurate release of 'Presumptive counts'

Microbiological Analysis of Shellfish

Future Options for TAT Reduction



Microbiological Analysis of Shellfish

Future Options for TAT Reduction

- Testing Vibrio species using DNA technology
 - AOAC has validated DNA method for Vibrio species testing
 - Potential of releasing Presumptive counts on Day 1
 - May not be approved for use on Regulated samples, but may offer an effective monitoring tool

Microbiological Analysis of Shellfish

Next steps

Maxxam's effort for serving Shellfish Growers

- Working with the CFIA and standardize the method with respect to:
 - Consider 'Presumptive Counts' as final results when Presumptive counts are within acceptable criteria
 - Discussion regarding the potential use of rapid procedures (Chrom-agar, DNA).

Thank you



Questions

Contact Us

Virendra Gohil
Manager, Scientific Services – Food Microbiology
vgohil@maxxam.ca



Appendix D: New Vp Control Plan in Washington, Clara Hard, Washington Department of Health

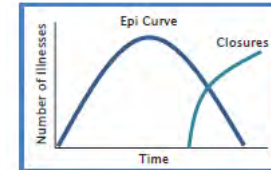
**New Vp Control Plan in Washington
(As of May 2015)**

Clara Hard
Shellfish Illness Coordinator
Office of Environmental Health and Safety
Washington Department of Health
December 4, 2015



Intent of Control Plan Revision

- ▶ Prevent V.p.-associated illnesses
 - Move towards a proactive management approach
 - Base controls on risk and environmental conditions
- ▶ Align Washington's Control Plan with the national requirements



2

Definitions

- ▶ Single-source Vp case: a laboratory-confirmed Vp-associated illness or illnesses with a common exposure that are reported to the department. The case must be:
 - Associated with commercially harvested shellstock;
 - Not involve documented postharvest abuse; and
 - Traced back to a single growing area.
- ▶ Control months: May 1st through September 30th
- ▶ Cool or cooling:
 - Adequately ice or place in a controlled environment with a temperature of 45°F (7.2°C) or less; and
 - Reach and maintain an internal oyster tissue temperature of 50°F (10°C) or less
- ▶ Harvest temperature: the water temperature or internal oyster tissue temperature at the time of harvest



3

Control Plan Rule Revision: Overview

Component	Old Plan	New Revisions
Shellfish production data	No requirements	Requirement to report
Growing area categories	Geographic area (coastal and inland)	Risk level (historic illness trend)
Time of harvest to	Temperature control (placing oysters in temperature control)	Cooling (reaching and maintaining 50°F/10°C)
Time reduction and closure	Sporadic illnesses	Air temperature threshold and Harvest (water or tissue) temperature threshold
Closure period	Remainder of control plan months	At least 24 hours



4

Control Plan Elements

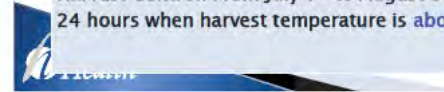
- ▶ Risk Categorization by Growing Area
 - Based on single source illnesses in past 5 years
 - Risk Category 1: 1 or fewer illnesses
 - Risk Category 2: 2-4 illnesses
 - Risk Category 3: 5 or more illnesses
 - 2015 categories (108 growing areas in WA):
 - Risk Category 2: 11 growing areas
 - Risk Category 3: 5 growing areas

- ▶ Exemptions
 - Oysters to be shucked or post-harvest processed with proper tagging
 - Waiver requested and approved



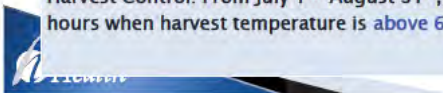
Risk Category 1

Requirements	Time to Cooling
Except as noted below, the time of harvest to cooling requirement from June 1 st to September 30 th is:	9 hours
When ambient air temperature at harvest is greater than 90°F/ 32.2°C, the time of harvest to cooling requirement is:	7 hours
When harvest temperature is between 68°F/20°C and 70°F/21.1°C from July 1 st to August 31 st , the time of harvest to cooling requirement is:	5 hours
Harvest Control: From July 1 st to August 31 st , harvest is not allowed for 24 hours when harvest temperature is above 70°F/21.1°C.	



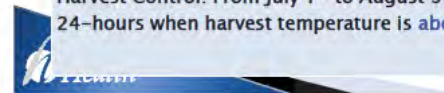
Risk Category 2

Requirements	Time to Cooling
Except as noted below, the time of harvest to cooling requirement from May 1 st to September 30 th is:	7 hours
When ambient air temperature at harvest is greater than 85°F/29.4°C, the time of harvest to cooling requirement is:	5 hours
When harvest temperature is between 66°F/18.9°C and 68°F/20°C from July 1 st to August 31 st , the time of harvest to cooling requirement is:	3 hours
Harvest Control: From July 1 st –August 31 st , harvest is not allowed for 24 hours when harvest temperature is above 68°F/20°C.	



Risk Category 3

Requirements	Time to Cooling
Except as noted below, the time of harvest to cooling requirement from May 1 st to September 30 th is:	5 hours
When ambient air temperature at harvest is greater than 80°F/26.7°C, the time of harvest to cooling requirement is:	3 hours
When harvest temperature is between 64°F/17.8°C and 66°F/18.9°C from July 1 st to August 31 st , the time of harvest to cooling requirement is:	1 hour
Harvest Control: From July 1 st to August 31 st , harvest is not allowed for 24-hours when harvest temperature is above 66°F/18.9°C.	

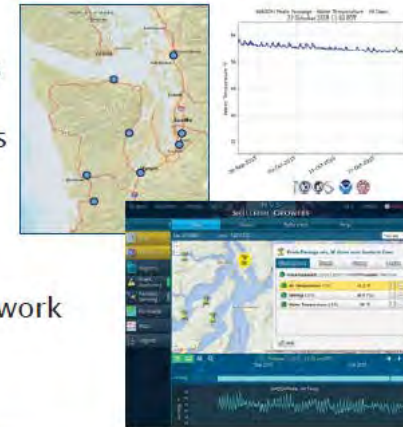


Timeline of Important Dates



Implementing the new rule

- ▶ Trainings
- ▶ Example records provided
- ▶ Emphasis patrols
- ▶ Single-source illness case follow-ups
- ▶ Near real-time temperature network on NANOOS



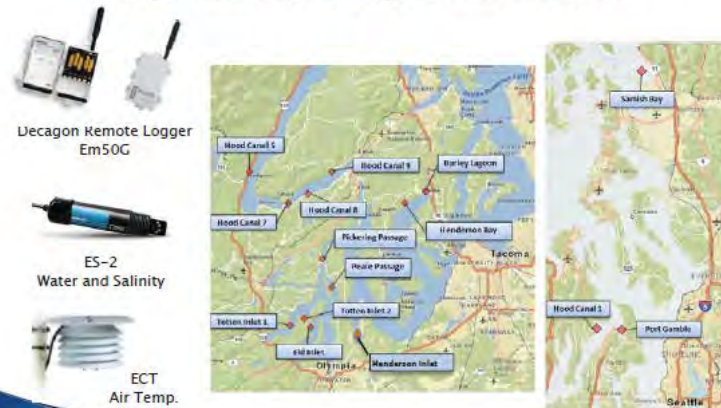
Illness Investigations

- ▶ Conducted follow-up illness investigations with shellfish companies for:
 - All single source illnesses
 - Many 2-3 company multi-source illnesses
 - Time of harvest, time of cooling, temperatures and records collected and verified by an inspector



2015 Cellular data-loggers on NANOOS

<http://nvs.nanoos.org/ShellfishGrowers>



Environmental Monitoring

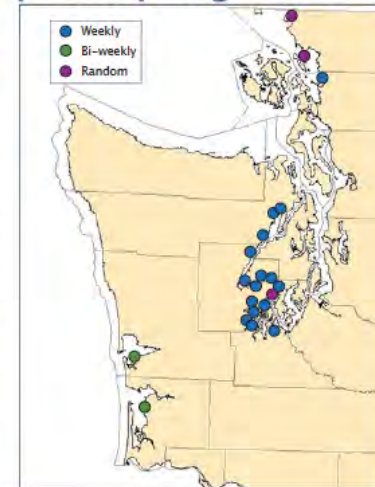
- Conduct monitoring from June through September and collect:
 - Oysters for tissue samples
 - Water, air and tissue temperature
 - Salinity
- Public Health Lab evaluates the oyster samples to quantify levels of:
 - tlh* (species marker)
 - tdh* (pathogenicity marker)
 - trh* (pathogenicity marker)



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Environmental Vp Sampling Sites

Growing Area	Site Name
Bay Center	Goosepoint
Dabob Bay	Rock Point Tarboo
Drayton Harbor	Drayton Harbor
Grays Harbor	Brady's
Hammersley Inlet	South Sound Mariculture
Henderson Inlet	Nisqually
Hood Canal 3	Taylor Brinnon
Hood Canal 4	Beacon Point
Hood Canal 5	Hama Hama
Hood Canal 6	Union
Hood Canal 7	Sisters Point
Hood Canal 8	Sanders
Hood Canal 9	DeNottas
North Bay	Taylor Victor
Oakland Bay	Taylor Chapman Cove
Pacific Coast	Quinault
Pickering Passage	Calm Cove
Quilcene Bay	Yacht Club
Samish Bay	Taylor East
Skookum Inlet	Wallins
Stretch Island	Pirate's Cove
Totten Inlet	Taylor Oyster Bay



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Oyster harvest closures due to environmental samples with *tlh* > 10,000 MPN/g

Growing Area	Closure Date	Reopening Date
Pickering Passage	8/25/15	7/22/15
Hood Canal 8	8/25/15	7/22/15
Hood Canal 7	7/2/15	7/22/15
Skookum Inlet	7/2/15	7/18/15
Hood Canal 4	7/9/15 (7/21)	7/22/15
Totten Inlet	7/9/15	7/22/15
Hammersley Inlet	7/9/15	7/22/15
North Bay	7/10/15	7/22/15
Hood Canal 8	7/30/15	8/13/15
Hood Canal 6	8/5/15	8/20/15
Hood Canal 9	8/6/15	9/4/15

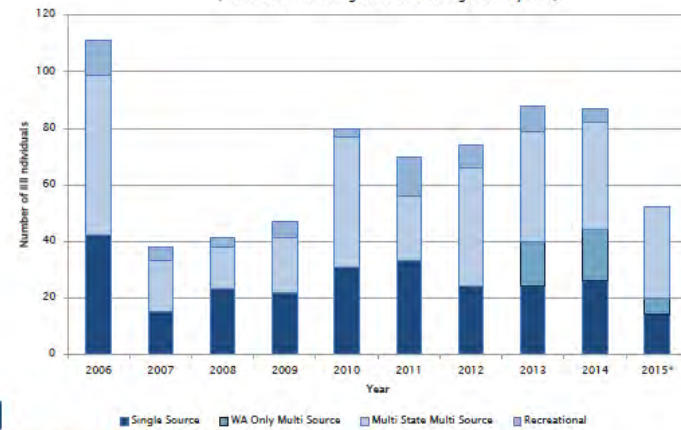


** Similar growing area closures and lengths of closures, but lower total *Vp* *tlh* values than previous years.



15

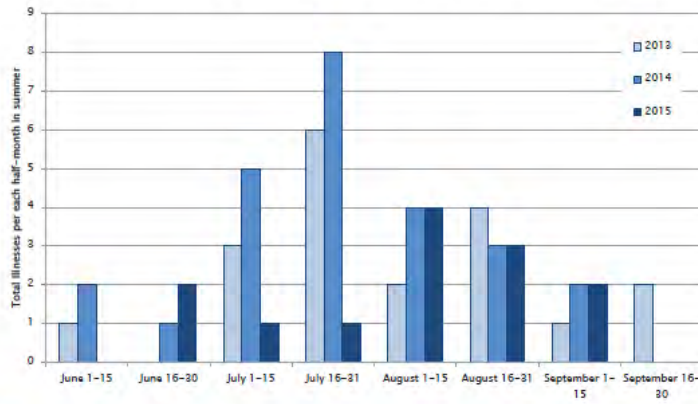
Total Vibrio Illnesses from Oyster Consumption (Attributed to Washington State Growing Areas by Year)



16

Vibrio parahaemolyticus Control Workshop

Single Source V.p. Illnesses from 2013 to 2015 by Harvest Date



17

Summary of 2015 Vp - Associated Illnesses

Commercial shellstock oysters	
Single-source	14
Multi-source	35
<i>WA only</i>	6
<i>WA + BC, PEI or NB</i>	12
<i>WA and other states</i>	17
Other commercial products	
Shucked oysters	1
Shucked and shellstock oysters	3
Other	
Documented post harvest abuse	6
No traceback	3
<i>WA resident consumed BC oysters</i>	2
<i>WA resident consumed CA oysters</i>	1

Non-commercial	
Crab	3
Crab and oysters	2
Swimming/ water exposure	2
Unknown private catch	1



** Still conducting traceback: 3
(1 multi-source, out of state;
2 in-state pending confirmation)



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Production data

- ▶ 1,918,518 dozen oysters
- ▶ 35 companies
- ▶ 31 growing areas



*data as of 11/30/15



Oyster Production Reporting Form

What Must Be Reported

What Should Not Be Reported

Company Name

Company Address

What Phone Number

Company State

Company ZIP

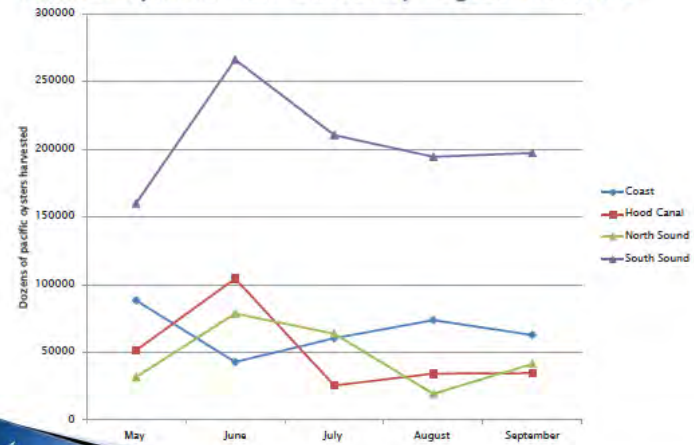
Company Type

Company Size

Company Other

19

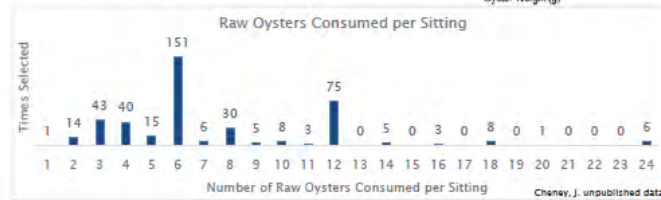
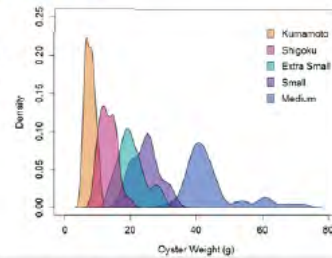
Pacific oysters harvested by region in 2015



*data as of 11/30/15

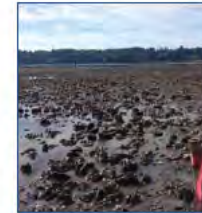
Localize risk model

- ▶ Develop in R
- ▶ Localize serving size
- ▶ Compare risk within state
- ▶ Integrate new data
- ▶ Useable for the shellfish industry



Next steps

- ▶ Review 2015 data and research findings
- ▶ Collect production data
- ▶ Refine risk model
- ▶ Continue forecasting efforts
- ▶ Assess rule in 2017



22

Thank You

Clara Hard
 clara.hard@doh.wa.gov
 360-236-3314

<http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/Rules/VibrioRuleRevision>

Key discussion points during development of the new rule

- ▶ How to structure plan
 - Risk Categories - regional and virulence differences
 - Industry self regulation vs Agency closures
- ▶ Requirement to report Landings Data
 - Confidentiality questions
- ▶ Calibration of thermometers
 - Heavy reliance on accurate temperatures
- ▶ Wet Storage question
 - More than 2 weeks in wet storage considered new growing area
- ▶ Transferring oysters prior to <50°F (<10°C)



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Appendix E: Temperature Tracing in Seafood and Other Industry Settings, Identifying Problem Distribution Points; Hilary Dovey, Dwayne Schmidt, Stan Meldrum; Precision Label, Ltd



Cold Chain Monitoring VIBRIO Workshop

December 4, 2015

PAKSENSE

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Cold Chain Coverage Under One Umbrella



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2

About PakSense

- Headquartered in Boise, Idaho, USA
- Canada – BC, AB, ON & QC
- 1,700 customers/ 75 countries
- Distribution network 35+ countries
- 10 years of industry innovation & new technology



PAKSENSE

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3

Our Presence in the Seafood Industry

- Fastest growing segment for cold chain monitoring
- Top player in cold chain monitoring for seafood in the world
- Customers include:
 - Quirch Foods
 - East Coast Seafood
 - Ocean Beauty
 - Thai Union Seafood (Chicken of the Sea)

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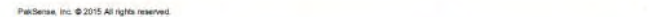
4

Why Monitor the Temperature of Your Products?

- FSMA, Healthy Food for Canadians Act
- Best practices
- Industry is standardizing these processes
- Competitive advantage – makes you look forward thinking
- Insurance policy



Oyster Cold Chain



Applications



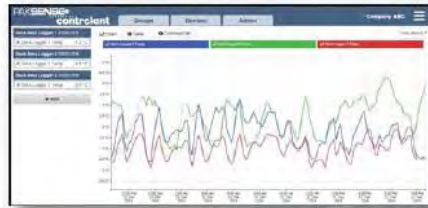
How to Choose a Cold Chain Partner

- Surface Reads vs. Ambient Air
- Form Factor- will it damage your product?
- Environmentally Friendly?
- Will they cover your whole cold chain?
- Digital vs. paper records



Record Keeping

- Maintain records of all shipments for audits
- Traceability



PAKSENSE

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9

PakSense Solutions

- Contact
- PDF
- Reusable Temp & Humidity
- Facility



PAKSENSE

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Facility Monitoring and Its Benefits

- Mitigate risk, minimize customer claims
- Record keeping (incident reports/audit trail)
- Immediate notifications if there are issues (power outages, cooling system breaks)
- One more part of cold chain protected

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11

Summary

- Seafood industry is trending towards more cold chain monitoring
- Regulations like FSMA and CFIA will require record keeping
- Proactive implementation minimizes shrink
- Minimal impact on current processes (easy to use and implement)

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12

Thank You

For more information and videos on our products, go to:
www.paksense.com



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Appendix F1: Vp Training Control Plan Requirements, Washington State Department of Health

**Vibrio parahaemolyticus Training:
Control Plan Requirements**

Office of Environmental Health and Safety



Training Overview

- ▶ Foodborne Illness
- ▶ *Vibrio parahaemolyticus*
- ▶ Model Ordinance Requirements
- ▶ Control Plan Revision
- ▶ Control Plan Requirements
- ▶ Compliance
- ▶ Harvest Plans
- ▶ Q&A

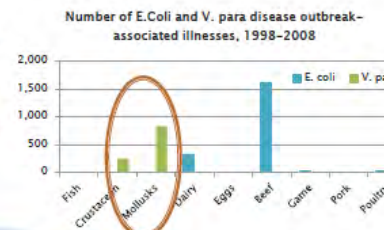
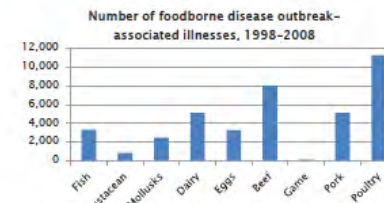


Food Contamination



Foodborne Illness

- ▶ According to the CDC:
 - 48 million people get sick with a foodborne illness each year in the U.S.
 - 128,000 people are hospitalized
 - 3,000 people die of foodborne diseases



Vibrio parahaemolyticus

- ▶ Naturally-occurring bacteria
- ▶ Common in warm marine and estuarine environments
- ▶ Illnesses usually caused by eating raw or undercooked shellfish



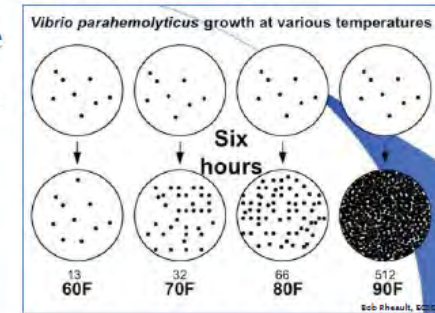
Symptoms	Onset	Duration
Watery diarrhea, abdominal cramping, nausea, vomiting, and fever	4-96 hours	2-5 days



Vibrio parahaemolyticus

Continued

- ▶ Highly temperature dependent
 - Post-harvest cooling important to limit growth
- ▶ Many strains, only some cause illness
- ▶ Genetic markers to identify presence and likelihood to cause illness
 - *tlh*
 - *tdh*
 - *trh*

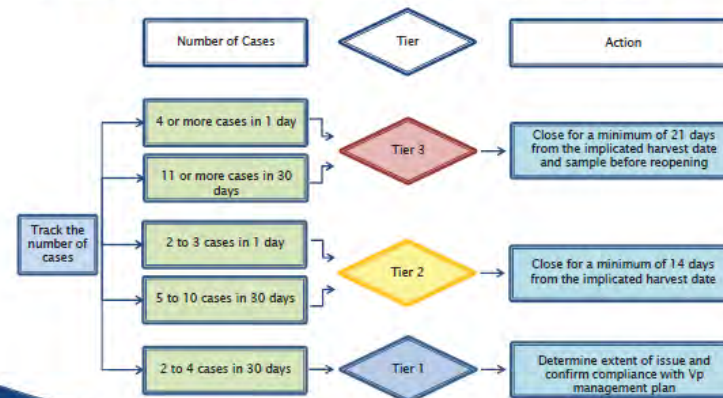


MO Control Plan Requirements

- ▶ Required for all states that have a risk of *Vibrio parahaemolyticus*-associated illnesses
- ▶ Goal is to reduce the likelihood of *Vibrio parahaemolyticus* illnesses during periods historically associated with illnesses
- ▶ Control requirements are in addition to NSSP Model Ordinance requirements

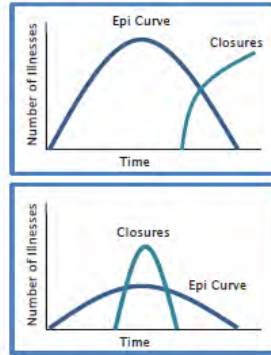


Additional MO Requirements



Intent of Control Plan Revision

- ▶ Prevent *Vibrio parahaemolyticus*-associated illnesses
- ▶ Move towards a proactive management approach
- ▶ Base controls on risk and environmental conditions
- ▶ Align Washington's Control Plan with the national requirements



Control Plan Rule Revision: Overview

Component	Current	Revision
Shucked meats	Label with "For cooking only"	Exempt shucked meats and post harvest processed oysters
Shellfish production data	No requirements	Requirement to report
Growing area categories	Geographic area (coastal and inland)	Risk level (historic illness trend)
Time of harvest to	Temperature control (placing oysters in temperature control)	Cooling (reaching and maintaining 50°F)
Time reduction and closure	Sporadic illnesses	Air temperature threshold and Harvest (water or tissue) temperature threshold
Closure period	Remainder of control plan months	24 hours



Control Plan Requirements: Subsection 1

- ▶ Establishes control plan
- ▶ Establishes control months
 - May 1 through September 30
- ▶ Requirements in addition to the National Shellfish Sanitation Program Model Ordinance



Control Plan Requirements: Subsection 2

- ▶ Exempts oysters harvested and delivered to a certified shucker packer for:
 - Shucking or
 - Postharvest processing (PHP)
- ▶ Requires harvest tag stating:
 - "For shucking by a certified dealer" or
 - "For PHP by a certified dealer"



Control Plan Requirements: Subsection 3

- Single-source Vibrio parahaemolyticus case or case: a laboratory-confirmed Vibrio parahaemolyticus-associated illness or illnesses with a common exposure that are reported to the department. The case must be:
 - Associated with commercially harvested shellstock;
 - Not involve documented postharvest abuse; and
 - Traced back to a single growing area.
- Control months: May 1st through September 30th
- Cool or cooling:
 - Adequately ice or place in a controlled environment with a temperature of 45°F (7.2°C) or less; and
 - Reach and maintain an internal oyster tissue temperature of 50°F (10°C) or less
- Harvest temperature: the water temperature or internal oyster tissue temperature at the time of harvest



Control Plan Requirements: Subsection 4

- Requirement to report oyster landings data by:
 - Month (May-September only),
 - Oyster species,
 - Size class for Pacific oysters, and
 - Growing area
- SS and SP licensees report by December 31st each year
- If landings are not reported, may not harvest oysters during the control months next year



Oyster Production Reporting - Sample Form

Oyster Production Report					
Company Name		<small>Use this form to organize oyster production in preparation for reporting to Washington Department of Health. Remember the production survey must be completed by all shellstock shippers (SS) and truck/packer (SP) licensees that harvest or purchase oysters directly from a licensed grower (PA) for half-shell sales. Oysters harvested for sale for steamed, seared or post-harvest processing (PAP) should not be reported. Oysters purchased from another dealer (DS or SI) should not be reported to avoid double counting.</small>			
Company License Number					
Growing Area					
	May	June	July	August	September
Pacific (up to 9")					
Pacific (9" to 4")					
Pacific (more than 4")					
Kumamoto					
Olympia					
Virginia					
Other					



Control Plan Requirements: Subsection 5 - 7

- Harvest plan should:
 - Describe harvest, temperature collection, cooling, and conveyance methods
 - Include example of harvest temperature record
 - Identify harvest temperature as water temperature or internal oyster temperature
- Submit to DOH by March 1st each year unless no changes have been made
 - Sign and date if no changes made
- May not harvest oysters in the control months without an approved harvest plan

March 1 deadline did not apply for 2015.



Harvest Plan – Sample Form

Commercial Shellfish Company
 Harvest Plan for *Vibrio parahaemolyticus* Control Measures

Company Name: _____
 Company Address: _____
 Company Phone: _____
 Company Email: _____

1. Harvest of oyster has occurred and, under the requirements of the Washington State Health Department, the harvest area has been categorized as follows: (WAC 165C-020-020)

Yes
 No

2. Person in charge has attended Washington State University's *Vibrio parahaemolyticus* training course by Department of Health?

Yes
 No – If no date is provided, attach _____

3. Will you be harvesting and processing product from a licensed harvest area?

Harvesting and processing product from a licensed harvest area
 Harvesting and processing product from a non-licensed harvest area



Control Plan Requirements: Subsection 8 – 9

- ▶ Cooling requirements and harvest controls are based on risk categorization
- ▶ Risk categories are based on cases attributed to the area
- ▶ Cases are attributed to a growing area when they:
 - Are associated with commercially harvested shellstock;
 - Did not involve documented postharvest abuse;
 - Are traced back to a single growing area; and
 - Occurred during the previous consecutive five-year period within the control months
- ▶ Growing areas in Willapa Bay and Grays Harbor are initially categorized in the lowest risk category



Control Plan Requirements: Subsection 10

- ▶ Category 1:
 - Average of 0.2, or fewer cases.
- ▶ Category 2:
 - Average of more than 0.2, but fewer than one cases.
- ▶ Category 3:
 - Average of one or more cases.

Category 2	Category 3
Burley Lagoon	Henderson Inlet
Dabob Bay	Hood Canal 5
Hammersley Inlet	Oakland Bay
Hood Canal 3	Pickering Passage
Hood Canal 4	Samish Bay
Hood Canal 6	
Hood Canal 7	
Hood Canal 9	
Peale Passage	
Quilcene Bay	
Skookum Inlet	



Control Plan Requirements: Subsection 11: Category 1:

Requirements:	Time to Cooling:
Except as noted below, the time of harvest to cooling requirement from June 1st through September 30th is:	9 hours
When ambient air temperature at harvest is greater than 90°F, the time of harvest to cooling requirement is:	7 hours
When harvest temperature is between 68°F and 70°F from July 1st through August 31st, the time of harvest to cooling requirement is:	5 hours
Harvest Control: From July 1st through August 31st, harvest is not allowed for twenty-four hours when harvest temperature is above 70°F.	



Transfer Record – Sample Form

Transfer Record

All Vibrio parahaemolyticus products being transferred from a harvester to a dealer must have a transfer record or transportation document.

This document must have the following information (example below):

1. The date of harvest.
2. The time of harvest (time the first oyster was removed from the water or exposed to the air by the harvesting tool).
3. The water temperature at the time of harvest.
4. The water temperature at the depth of the oysters or an internal meat temperature of the product being harvested.
5. The risk category for the harvest area.

Invoice

Invoice Number: _____

Invoice Date: _____

Invoice Time: _____

Invoice Location: _____

Invoice Risk Category: _____

Harvester Name	Harvester Address	Harvester Phone	Harvester Email

Transfer Record Form (Sample Form) - 2017



Control Plan Requirements: Subsection 16

- ▶ Complete an initial training prior to harvesting or shipping oysters during the control months
- ▶ Complete a refresher training within one year following rule revision or at least every five years
- ▶ Those responsible for the on-site management of harvest activities must be trained by either:
 - Harvesters and shellfish dealers at their operation who completed the department-approved training, or
 - The department
- ▶ Record those trained in operational records



Control Plan Requirements: Subsection 17 – 20

- ▶ May request a waiver from a requirement of this section
- ▶ Waiver request must:
 - Be in writing, identify the requirement requested to be waived, state the reason for the waiver, provide supporting information
- ▶ DOH may grant the request if it:
 - Is consistent with applicable standards and the intent of this section
 - Provides a comparable level of public health protection



Control Plan Requirements: Subsection 21

- ▶ The department shall review this section to evaluate the effectiveness of the rules and determine areas where revisions may be necessary by October 2017.



Timeline of Important Dates



Compliance:

- ▶ Harvesters:
 - ▶ M.O. VIII. .01
 - G. Shellstock Temperature Control
 - (1) All harvesters shall comply with the applicable time to temperature requirements of
 - (a) State *V.v.* and *V.p.* Control Plans outlined in Chapter II. @.06 and @.07
- ▶ Dealers (SS/SP):
 - ▶ M.O. XI,XIII. .01
 - A. Receiving Critical Control Point – Critical Limits.
 - (1) The dealer shall ship/shuck and pack only shellstock obtained from a licensed harvester who has:
 - (c) Harvested the shellstock in compliance with the time temperature requirements of Chapter VIII. @.02 A. (1), (2), or (3) as determined from records supplied by the harvester described in Chapter VIII. .02 G. (2) [C].

Compliance

- ▶ Companies must have a harvest plan prior to Vibrio season.
- ▶ Companies must maintain records required by the Vibrio plan. Dealers these records are HACCP records.
- ▶ DOH inspectors will work with companies to refine their plan and records throughout the first season.
- ▶ Companies will be required to submit Vibrio product landings data by Dec. 31, 2015.
- ▶ 2016 – Companies must have department approved harvest plan prior to March 1, 2016, and have submitted previous year landings data to be authorized to harvest oysters for raw consumption during Vibrio season.

Contact Information

Name	Phone	Email
Darin Klein	360-236-3341	Darin.Klein@doh.wa.gov
Cari Franz-West	360-236-3326	Cari.Franz-West@doh.wa.gov
Laura Johnson	360-236-3333	Laura.Johnson@doh.wa.gov
Clara Hard	360-236-3314	Clara.Hard@doh.wa.gov



Appendix F2: 2015 Vp Control Plan Training Review, Washington State Department of Health



2015 *Vibrio parahaemolyticus* Control Plan Training Review

Office of Environmental Health and Safety



What is the deadline for shellfish dealers to submit production data to the Department of Health?

2

What are your options for taking harvest temperature?

3

When harvesting in the control plan months, what temperatures do you have to take prior to harvest?

4

What risk category is Oakland Bay in?

What risk category is Hood Canal 6 in?

What risk category is Nahcotta in?

5

It is June 2nd and your company is harvesting from Dabob Bay. The air temperature it is 80 °F and water temperature is 70°F.

Can you proceed with the harvest?

If so, how many hours do you have to cool the product?

If not, why?

6

It is July 2nd and your company is harvesting from Dabob Bay. The air temperature it is 80 °F and water temperature is 70°F.

Can you proceed with the harvest?

If so, how many hours do you have to cool the product?

If not, why?

7

It is September 30th and your company is harvesting from Hood Canal 5. The air temperature it is 86 °F and water temperature is 67°F.

Can you proceed with the harvest?

If so, how many hours do you have to cool the product?

If not, why?

8

It is July 16th and your company is purchasing product from a harvester that harvested oysters at 2:00pm from Hood Canal 9. The air temperature was 86°F and the internal oyster tissue temperature was 62°F. It is now 4:00pm.

Can you purchase these oysters and sell them as shellstock?

If so, how many hours do you have to cool the product and what information must the harvester provide to you?

If not, why?

9

It is June and ABC Shellfish (1234-HA) is harvesting oysters from Hood Canal 5. They started harvesting at 11:00 am and it is now 1:00 pm. The temperature outside is 84°F and their refrigeration unit on their truck is not working and ice is not available. Their customer, Peet's Clam Shack (987-SS) is 2 hours away. ABC Shellfish is working quickly to get their product off the beach and loaded for delivery.

What are the requirements for this company?

What are their options?

10

Appendix F3: Vp Control Plan Training Certificate, Washington State Department of Health



Appendix F4: Vp Rule Training Agenda, Washington State Department of Health



WASHINGTON STATE DEPARTMENT OF HEALTH
Vp Rule Training
August 28, 2015
Tumwater

10:00 – 10:15 a.m.	Welcome/Introductions
10:15 – 10:30 a.m.	Foodborne Illness and <i>Vibrio parahaemolyticus</i> Overview
10:30 – 11:00 a.m.	Model Ordinance Requirements & Control Plan Requirements
11:00 – 11:15 a.m.	Break
11:15 – 12:30 p.m.	Control Plan Requirements
12:30 – 1:30 p.m.	Lunch (on your own)
1:30 - 2:00 p.m.	Compliance
2:00 – 2:45 p.m.	Harvest Plans
2:45 – 3:00 p.m.	Break
3:00 – 4:00 p.m.	Q & A

Appendix F5a: Vp Harvest Plan form, Washington State Department of Health



Office of Environmental Health and Safety

Commercial Shellfish Company

Harvest Plan for Vibrio Parahaemolyticus Control Months

(For Office Use Only) Date Received	(For Office Use Only) Reviewed By:
	Assigned Inspector
	Approved by

Company Information:

Company Name / Certification Number: _____

Point of Contact: _____ Phone: _____

E-mail: _____ Cell: _____

1. Person in charge has read and understands the requirements of the Washington State *Vibrio parahaemolyticus* control plan found in WAC 246-282-006?
 Yes
 No
2. Person in charge has attended Washington State *Vibrio parahaemolyticus* training offered by Department of Health?
 Yes
 No – If no date scheduled to attend _____
3. Will you be harvesting product or purchasing product from a licensed harvester or dealer?
 Harvesting complete question 4-8
 Purchasing complete questions 8-10
 Both harvesting and purchasing complete question 4-10

Vibrio parahaemolyticus Control Workshop



Harvest Plan for *Vibrio parahaemolyticus* Control Months

10. Describe the method you will use to adequately cool the product in accordance with the guidelines established in the *Vibrio parahaemolyticus* control plan found in WAC 246-282-006.

Owner/Manager Signature

Date signed

Notes:

1. *Vibrio parahaemolyticus* product refers to shellstock (in-shell) oysters harvested during the months of May through September.
2. Please attach a copy of your company's harvest temperature record.
3. Request for a waiver of any of the requirements of the *Vibrio* Control Plan may be made to the DOH. The request must:
 - a. State the requirement to be waived.
 - b. State the reason for the request, including:
 - a. How it is consistent with the applicable standards and the intent of the Vp control plan; and
 - b. How it provides a comparable level of public health protection to the requirement being waived.
 - c. Include supporting information.

Appendix F5c: Oyster Production Report form, Washington State Department of Health

Oyster Production Report

Company Name	
Company License Number	

Growing Area	
---------------------	--

Use this form to organize oyster production in preparation for reporting to Washington Department of Health. Remember the production survey must be completed by all shellstock shipper (SS) and shucker packer (SP) licensees that harvest or purchase oysters directly from a licensed harvester (HA) for half-shell sales. Oysters harvested or sold for shucked meat or post-harvest processing (PHP) should not be reported. Oysters purchased from another dealer (SS or SP) should not be reported to avoid double-counting.

	May	June	July	August	September
Pacific (up to 3")					
Pacific (3" to 4")					
Pacific (more than 4")					
Kumamoto					
Olympia					
Virginica					
Other					

Appendix F5d: Transfer Records, Washington State Department of Health

Transfer Records

All *Vibrio parahaemolyticus* products being transferred from a harvester to a dealer must have a transfer record or transportation document.

This document must have the following information (example below):

- a. The date of harvest.
- b. The time of harvest (time the first oyster was removed from the water or exposed to the air by the receding tide).
- c. The air temperature at the time of harvest.
- d. The water temperature at the depth of the oysters or an internal meat temperature of the product being harvested.
- e. The risk category for the harvest area.

<p>[Your Company Name] <i>[Your Company Slogan]</i></p> <p>[Street Address] [City, ST ZIP Code] Phone [(509) 555-0190] Fax [(509) 555-0191]</p> <p>TO: [Name] [Company Name] [Street Address] [City, ST ZIP Code] [Phone]</p>	<p>INVOICE</p> <p>INVOICE # [100] DATE: OCTOBER 9, 2011</p> <p>FOR: [Project or service description] [P.O. #]</p>														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">DESCRIPTION</th> <th style="width: 10%;">HOURS</th> <th style="width: 10%;">RATE</th> <th style="width: 20%;">AMOUNT</th> </tr> </thead> <tbody> <tr> <td style="height: 150px; vertical-align: top;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Harvest date: 7/11/15 Harvest Time: 6:00 am Air Temp.: 60° Water Temp.: 60° Risk Category: 3 </div> </td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3" style="text-align: right;">TOTAL</td> <td></td> </tr> </tbody> </table>				DESCRIPTION	HOURS	RATE	AMOUNT	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Harvest date: 7/11/15 Harvest Time: 6:00 am Air Temp.: 60° Water Temp.: 60° Risk Category: 3 </div>				TOTAL			
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TOTAL															
<p>Make all checks payable to [Your Company Name] Total due in 15 days. Overdue accounts subject to a service charge of 1% per month.</p> <p style="text-align: center;">Thank you for your business!</p>															

Vibrio parahaemolyticus Control Workshop

If product is cooled prior to transfer the harvester must include the following (example below):

- a. The date of harvest.
- b. The time of harvest (time the first oyster was removed from the water or exposed to the air by the receding tide).
- c. The air temperature at the time of harvest.
- d. The water temperature at the depth of the oysters or an internal meat temperature of the product being harvested.
- e. The risk category for the harvest area.
- f. The temperature the product was cooled to.
- g. The time the temperature was taken.

<p>[Your Company Name] <i>[Your Company Slogan]</i></p> <p>[Street Address] [City, ST ZIP Code] Phone [(509) 555-0190] Fax [(509) 555-0191]</p> <p>TO: [Name] [Company Name] [Street Address] [City, ST ZIP Code] [Phone]</p>	<p>INVOICE</p> <p>INVOICE #[100] DATE: OCTOBER 9, 2011</p> <p>FOR: [Project or service description] [P.O. #]</p>														
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<p>Make all checks payable to [Your Company Name] Total due in 15 days. Overdue accounts subject to a service charge of 1% per month.</p> <p style="text-align: center;">Thank you for your business!</p>															

