Recommendations from the National Working Group for *Vibrio parahaemolyticus* Control in BC Oysters for Raw Consumption

August 24, 2016

ACKNOWLEDGEMENTS

These recommendations and report were created through the combined efforts of the national *Vibrio* working group. Members of this group included the following individuals and organizations:

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BACKGROUND

Vibrio parahaemolyticus (*Vp*) is a naturally occurring bacterium found in coastal waters worldwide. In 2015, Canada experienced its largest outbreak of culture confirmed *Vp* cases. A provincial outbreak investigation was launched on July 29 following a larger than expected number of *Vp* cases in both British Columbia (BC) and Alberta (AB). Consumption of raw oysters harvested from BC was identified as the cause of the infections.

A host of control measures were implemented in BC to control the outbreak, including: public communications; targeted messaging for restaurants serving raw BC oysters; warnings for the public at restaurants serving raw BC oysters; and an order to stop the sale of raw BC oysters in one health authority.

A health risk assessment conducted by Health Canada (HC) on August 18 assigned a health risk 3[1] for raw BC oysters that were in distribution. Subsequently, the Canadian Food Inspection Agency (CFIA) worked with the BC oyster industry to implement a voluntary recall of all raw BC oysters available in the marketplace. On August 21, CFIA issued further risk management by requiring that all lots of processed BC oysters harvested for raw consumption had to demonstrate satisfactory microbiological results, consistent with the HC interim bacteriological guideline[2], prior to distribution. The risk management action was lifted on October 20, however the interim bacteriological guideline was left in place, pending further review of the *Vp* control program in Canada.

The large number of illnesses associated with the *Vp* outbreak was unexpected. The onset of *Vp* illnesses earlier in the year appears to have been be the result of abnormally high water temperatures earlier in the year than expected. The investigation and response by the industry and regulators identified several issues and gaps in the current *Vp* control program in BC.

On December 4, 2015, following different debriefing meetings involving regulators, public health agencies and the shellfish industry, a workshop was held in Courtenay, BC. The objectives of the workshop were to address concerns arising from the *Vp* outbreak, to identify improvements in the control of *Vp* in BC and to develop a risk based approach to managing *Vp* in BC oysters for raw consumption that is inclusive of all sectors. Following a recommendation from participants in this workshop, a national working group was established in January 2016. The terms of reference and composition of the working group are described below.

[1] Health Risk 3 represents a situation where there is a reasonable probability that the consumption/exposure to a food is not likely to result in any adverse health consequence. The situation identified may be an indication of a breakdown in Good Manufacturing Practices; in Good Agricultural Practices; in Good Practices in Veterinary Medicine or some other relevant factor.

[2] Health Canada, personal communication

Bacteriological guideline (end-product) for *Vp*

Test Organism	Product Type	Number of sample units	Acceptance number (c)	m	M	Criteria for action
Vibrio parahaemolyticus	Raw oyster	5	0	100 MPN/g	n/a	Reject if any unit is equal to or exceeds m[a]

[a]number of bacteria per gram separating acceptable from marginally acceptable samples

TERMS OF REFERENCE FOR THE NATIONAL WORKING GROUP FOR *VIBRIO PARAHAEMOLYTICUS* CONTROL IN BC OYSTERS FOR RAW CONSUMPTION

Background:

As a result of the 2015 national outbreak of *Vibrio parahaemolyticus* (*Vp*) in consumers of raw oysters, a multi-jurisdictional approach to recommend controls for *Vp* in oysters was proposed. It is the intention of this working group to propose a plan for *Vp* control by May 2016.

Purpose:

Short Term Goals:

- To propose and develop recommendations for *Vp* control prior to May 1, 2016 inclusive of industry, regulators, and public health sectors to allow safe product to reach the market;
- Identify issues and gaps in the current *Vp* control program;
- Identify data sources to (1) improve *Vp* monitoring; (2) improve risk assessments;
- Improve collection of data to (1) inform the measurement of *Vp* program effectiveness, and to (2) inform investigations and specific control actions; and
- More transparently communicate and share data to allow more meaningful reporting to all stakeholders.

Medium & Long Term Goals:

- To create a practical effective *Vp* control program, which should result in:
  - Allowing industry to thrive, and increase stakeholder confidence; and
  - Improved public health outcomes, by reducing *Vp* illnesses;
- To create a working group mechanism that will better maintain an effective management communication system for all stakeholders in the future; and
- To evaluate and continuously improve *Vp* controls on an ongoing basis as needed.

Scope:

BC oysters for raw consumption

Scope of Work:

- To review existing controls for *Vp* in the BC program,
- To review controls for *Vp* elsewhere (in US or internationally) based on best current practices, regulations, and standards,
- To review recommendations and ideas proposed at the *Vp* workshop on Dec 4, 2015,
- To recommend enhancements in the key areas of control, education, surveillance, and communication, and,
- Retrospective analysis of causes, failings, and risks in the 2015 *Vp* outbreak

Working Group Participants:

The working group was chaired by April Hexemer, Public Health Agency of Canada, and consisted of representatives appointed from the organizations listed below, and others as required.

1. BC Shellfish Growers' Association (BCSGA) and industry
2. Canadian Food Inspection Agency (CFIA)
3. BC Centre for Disease Control (BCCDC)
4. Fisheries and Oceans Canada (DFO)
5. Regional Health Authority; Vancouver Coastal Health (VCH) and Island Health Authority (VIHA)
6. BC Provincial Ministry of Agriculture (MAGRI)
7. Health Canada (HC)
8. Public Health Agency of Canada (PHAC)

Roles and Responsibilities:

Chair

The working group chair is a Manager or designate from the Outbreak Management Division of the Public Health Agency of Canada. The key responsibilities of the working group Chair were:

- Managing working group meetings
- Facilitating discussion and decision-making using a consensus-based approach
- Fulfill the responsibilities listed under the working group members
- Follow-up on action items as needed

Secretariat

The role of the Secretariat is filled by BCCDC working group participants. The key responsibilities of the Secretariat were:

- Arrange meeting logistics and sending out invitations
- Prepare and distribute meeting agendas, records of decision, and all other relevant background material to the working group
- Compile information into a final report

Members

The key responsibilities of the working group members were:

- Act as a liaison between their Agency/Association/Organization and the working group
- Provide updates on their Agency/Association/Organization's activities
- Review meeting material in advance of the meeting to be fully prepared for meaningful discussion
- Participate in working group meetings or designate an alternate when they are unable to attend
- Follow through on action items
- Notify the Secretariat of any changes in membership

Deliverable:

A report with recommendations for *Vp* control in BC oysters for raw consumption.

Timeline:

- Review issues by February 26, 2016
- Draft recommendations by March 30, 2016
- Finalized report for 2016 by April 15, 2016
- Review effectiveness of 2016 plan by January 1, 2017
- Further recommendations ongoing

The frequency of meetings was bi-weekly until May 20, 2016 and was determined based on need going forward.

RECOMMENDATIONS FROM THE NATIONAL WORKING GROUP FOR *VIBRIO PARAHAEMOLYTICUS* CONTROL IN BC OYSTERS FOR RAW CONSUMPTION

These recommendations are grouped into four main areas: Prevention and Control Measures; Communication; Outbreak Detection and Response; and Risk Management. For each of these areas, the issues and corresponding gaps identified by the Working Group are described and recommendations made for each of these issues. The report is intended for the Working Group members and their organizations, as identified in the recommendations. All Working Group members contributed to this document based on their knowledge and expertise and are committed to explore the implementation of the recommendations relevant to their own department. While the attending members are in favour of the recommendations made, it is acknowledged that the implementation of those recommendations must be discussed at various levels within the organization, as they may have broader implications. The status of implementation of the recommendations in this report will be reviewed as per the Working Group terms of reference by 2017.

1. Prevention and Control Measures

1.1. Harvest Plan

1.1.1. **Gap 1:** The supplier quality assurance (SQA) plans that processors require from growers do not clearly address all factors that can affect *Vp* growth beyond standard acceptable limits.

Recommendation 1: SQA harvest plans need to be developed by the industry on a site specific basis. SQA plans need to include control measures designed to ensure final product meets Canadian microbiological standards.

Recommendation 2: CFIA should provide enhanced guidance to processors to identify requirements for *Vp* control verification activities required in an SQA. CFIA should require processors (registered establishments) to have an SQA with all growers.

1.1.2. **Gap 2:** There is inadequate verification of the SQA to identify control gaps. It is also unclear who has to verify that the SQA plans are correctly implemented.

Recommendation 3: CFIA should provide guidance to processors on appropriate measures they can take to validate SQAs with growers. CFIA should incorporate audits of SQAs into processor audits conducted by CFIA and these should contain (1) SQAs are available for every grower processors purchase from, and (2) processors validate SQAs annually with each grower through on-site inspection or some other approved method.

Recommendation 4: CFIA should work to develop improved guidance in terms of what is expected regarding validation of control measures, such as (1) frequency for monitoring of *Vp* in oysters prior to harvest (i.e. verification samples), and (2) pre-harvest, harvest and delivery with time and temperature controls.

1.1.3. **Gap 3:** There is no proactive communication amongst processors and/or regulators about growers who have provided non-compliant product.

This is an unresolved risk.

1.2. Audits

1.2.1. **Gap 1:** There is a lack of inspection at BC oyster harvest sites, and during transport/delivery.

Recommendation 5: CFIA and DFO should be inspecting harvest sites and delivery sites routinely, and as necessary when problem-driven (e.g. when non-compliant product is received by a processor, or non-compliant product results in human illness). Routine visits should include on-site observational audits of SQAs (growers) to ensure processors are correctly implementing validation activities with growers.

Recommendation 6: DFO should incorporate some basic site specific conditions (SSC) related to *Vp* to be included in licenses for those harvesting oyster for raw market. Compliance with these SSC should become part of regular compliance inspections.

1.2.2. **Gap 2:** It is unclear who has jurisdiction to conduct inspections and audits at farm sites and delivery sites. BC Ministry of Agriculture has the ability to regulate trucks engaging in delivery of shellfish. However, vehicles are not licensed which makes enforcement challenging. Additionally, there is a need to review existing requirements for transportation to ensure requirements for raw oysters are adequate.

Recommendation 7: Because CFIA has the ability to regulate landing sites and transport vehicles, according to Schedule V of the Fish Inspection Regulations, CFIA should do this.

Recommendation 8: DFO jurisdiction over aquaculture is limited to their authority under the Fisheries Act[3]. Vehicles used to transport shellfish (e.g., boats, trucks) should be required to keep shellfish refrigerated to a required standard. DFO should therefore inspect shellfish operations and transport vehicles as per their authority under the Act.

Recommendation 9: BC Ministry of Agriculture should review transportation requirements for vehicles transporting oysters for raw consumption to market to ensure requirements for control of this food product exist.

Recommendation 10: BC Ministry of Agriculture should review how inspection and enforcement of these requirements occur.

1.2.3. **Gap 3:** There is lack of information about inspections at provincial plants that perform secondary processing of oysters for raw consumption (i.e. repackaging) for product that has previously passed through a federally registered shellfish processor. Operators of provincial fish processing plants must comply with the construction and operational requirements of the BC Fish Inspection Regulations[4]. Compliance inspections are conducted at all provincial processing plants prior to licenses being issued.

Recommendation 11: BC Ministry of Agriculture should conduct inspections of provincially licensed plants based on risk.

Recommendation 12: BC Ministry of Agriculture should develop a risk evaluation matrix to determine inspection times and frequency to include:

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[3] http://laws-lois.justice.gc.ca/eng/acts/F-14/page-1.html#h-2 Per Regulations 43.1.c and 43.1.d, DFO should require fisherman to refrigerate shellfish after harvest (per 43.1.c) and during transportation to processing plants (per 43.1.d)

[4] http://www.bclaws.ca/civix/document/id/complete/statreg/12_78
Relevant parts include; Applicable sections of Schedule A and B, Section 20, (fish for processing), Section 21(b), fish being transported), 12(3) requirements for all product to go through federal plants prior to sale, Section 54 harvesting and tagging.

a. the commodities handled/processed and their inherent hazards;
b. required frequency of follow up inspections and the severity of any noted deficiencies.
c. the operators' compliance history and response;
d. *Vp* concerns, as environmental triggers are reached

1.3. Temperature control

1.3.1. **Gap 1:** There is a lack of a standard protocol for temperature monitoring and verification throughout distribution.

Recommendation 13: Premises along the food chain accepting oysters for raw consumption should:

- check and record oyster meat temperatures, or delivery truck temperatures on arrival at the premises, and
- reject shipments exceeding 4°C during distribution or on arrival at restaurant/retail premises.

Regulators (CFIA, BC Ministry of Agriculture and Health Authorities (HAs)) should verify that the different industry players and premises follow this recommendation.

1.4. Product testing

1.4.1. **Gap 1:** There is a lack of testing of BC oysters throughout the distribution chain to identify where the potential loss of control occurs.

Recommendation 14: CFIA has additional lab capacity to test for *Vp* in oysters in 2016, and should participate in discussions with BCCDC and industry for best coordination of sampling efforts.

1.5. Product control

1.5.1. **Gap 1:** There is a lack of documentation (e.g., records) to verify that monitoring activities occur as stated in control programs. There are no documentation requirements for provincial-only operators to verify temperature/time monitoring activities. Current regulations do not require a HACCP approach for provincial fish plant operations, but regulations are being developed under the new Fish and Seafood Act that will require this, starting in 2017.

Recommendation 15: As a short term solution, and before the new Fish and Seafood Act and accompanying regulations come into place, the BC Ministry of Agriculture should consider implementing recommendations on best practices that are proposed by the national working committee for provincial processing plants.

Recommendation 16: BC Ministry of Agriculture should increase operational inspections at provincial processing plants to verify implementation of best practices based on a risk assessment approach (as per Recommendation 12).

Recommendation 17: BC Ministry of Agriculture should require a HACCP approach for provincial plant operations.

Recommendation 18: Growers, harvesters, transporters and processors handling the oysters should be monitoring the activities described in the control programs, and keeping records. CFIA should ensure that the records are available, within CFIA's regulatory authority.

1.5.2. **Gap 2:** There is no standard for cooling of oysters, only that the product must be adequately chilled, and recommendations for cooling are not listed on the CFIA web-site.

Recommendation 19: CFIA should re-distribute recommendations that were previously issued regarding cooling, and post them onto their web-site. However, these time and temperature recommendations are to be considered starting points for controlling *Vp* growth. In combination with monitoring to verify that *Vp* is present at acceptable levels at the time of harvest, growers and harvesters will be expected to verify that these time and temperature controls are effective for preventing post-harvesting growth for their locations and operations, or to develop alternative controls that are effective.

See also recommendation 15 above.

1.6. Risk awareness

1.6.1. **Gap 1:** Growers, harvesters, processors, distributors, restaurants, retailers and other end users are not aware of the importance of temperature control of *Vp* and associated risks in oysters and shellfish. Education and training on temperature as a control measure for *Vp* is required for all persons handling oysters in the food chain. Education and training is supported by Codex guidelines on *Vp*[5]. Education on *Vp* issues can occur in a variety of media, such as workshop specific training opportunities, presentations at conferences, distribution of educational materials, and on-the-job training.

Recommendation 20: Business owners should ensure that staff involved in handling, harvesting, shipping, processing, holding, distributing and the sale of oysters receive appropriate training on the importance of temperature control. The implementation of this recommendation should be verified by regulators (DFO, CFIA, BC Ministry of Agriculture and HAs).

Recommendation 21: The FOODSAFE training curriculum should include education and training on oysters for raw consumption.

Recommendation 22: An evaluation system of training effectiveness should be implemented by regulators who have oversight of businesses along the food chain. Effectiveness of education can be evaluated by: (1) tracking the percentage of identified growers, processors, distributors, and retail/restaurant premises who have received information or training; and/or (2) through a survey of knowledge or practices, or observations of practices during inspections, or by some other method.

1.6.2. **Gap 2:** Understanding of high risk points in the shellfish distribution chain is not consistent across all partners, including who has jurisdiction to take specific control actions to mitigate identified risks.

Recommendation 23: BCCDC should lead the creation of a process map of the distribution chain. All partners should review and accept it. Control of risk and who is most responsible, or risk with shared responsibility, should be identified to inform potential control measures.

[5] CAC/GL 73-2010

1.6.3. **Gap 3:** Education (as described under Gap 1) of shellfish growers is not a requirement in BC as it is in Washington State[6].

Recommendation 24: Mandatory training should be required by regulators for persons overseeing harvesting or farming operations, such as farmers handling oysters for raw consumption during *Vp* season. Mandatory training should also be considered for others who handle oysters for raw consumption such as distributors, transporters, truckers and other personnel. Regulators (DFO, CFIA and BC Ministry of Agriculture) should investigate their legal authority to require mandatory training, and if appropriate, require it.

Recommendation 25: Agencies should review their regulations to define what is meant by training to ensure that training requirements would include those necessary for shellfish growers handling oysters for raw consumption.

Recommendation 26: All partners should issue a joint letter of endorsement for training for all persons handling oysters in the food chain, with the intent that this letter can be broadly distributed and used by all partners as needed to support educational initiatives.

[6] Shellfish harvester training is required for all licensed harvesters to meet the National Shellfish Sanitation Program Model Ordinance Chapter XIII .01 B. More information available at http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/CommercialShellfish/Training

2. Communication

There is a need for government regulators, public health partners and industry to communicate and exchange information both during times of routine surveillance, and during times of *Vp* outbreaks.

Routine communication with industry directly resides with the agencies that regulate and issue licenses. These agencies include DFO, who license oyster farmers; CFIA and the BC Ministry of Agriculture, who license federal level and provincial level processors and distributors, respectively; and the HAs, who license restaurants. Communication amongst these organizations occurs via several means, including e-mail distribution list-serv messaging (via DFO http://www-ops2.pac.dfo-mpo.gc.ca/fns_reg/index.cfm; via CFIA for recalls, foodrecalls_rappelsaliments@www.agr.gc.ca and Pacific Shellfish processors. Another avenue of communication can be in the form of social media, newsletters to premises (used by HAs) or communiques (used by BC Ministry of Agriculture). The national *Vp* working group in place now is working well as a vehicle to communicate. An end of season annual debriefing would also assist in sharing information between all partners.

Communications during *Vp* outbreaks, and when triggers appear that indicate heightened surveillance and intervention measures may be warranted, are also required. Triggers for these inter-agency meetings should be based on a threshold that may include one or more, or other as yet unidentified, factors: by date, temperature, or number of illness(es). Meetings that are inclusive of industry leading up to and during outbreaks would be in addition to parallel meetings occurring as a result of outbreak investigations (i.e. Outbreak Investigation Coordinating Committee (OICC) calls, provincial calls).

2.1. Stakeholder communication

2.1.1. **Gap 1:** There isn't an established process for exchange of information between public health partners and industry representatives and restaurants during *Vp* outbreaks. It is not clear which government partner(s) has/have responsibility for communication with industry during outbreaks. It isn't clear how information is communicated between government and industry and who wants what information.

Recommendation 27: *Vp* working group meetings should be scheduled to continue onwards from May 1st until the end of 2016 on a monthly basis. Meeting frequency may increase once an identified trigger or threshold is reached.

Recommendation 28: In the MARTOX report, a sentence should be added by the BCCDC to the weekly surveillance report to indicate whether the number of cases is within or above expected.

Recommendation 29: An end of season debriefing 'hot-wash' should be held between all members of the National *Vp* Working Group. This will include evaluating the value of National *Vp* Working Group meetings.

Recommendation 30: Membership for a local BC *Vp* working group should be identified.

Recommendation 31: The e-mail addresses of the BC *Vp* working group should be used in the event there is a need to communicate urgently on an issue to all agencies.

Recommendation 32: Regulators managing *Vp* should reinstate an end of season debriefing 'hot wash' to review issues identified during the season.

2.1.2. **Gap 2:** Public health authorities do not have a means to contact producers (including farmers, processors, shippers and distributors) as their contact details are not public. There may be a need for public health institutions to communicate with producers to share data, advisories and other communications. The BCSGA contains at present 176 members in their database, however, they do not include all growers, harvesters and/or processors. In addition the BCSGA does not include distributors or restaurant/retail contacts.

Recommendation 33: Regulators and industry who hold contact information for producers should develop a procedure for either sharing of producer contact information with public health authorities, or for distributing information outwards to the producers from public health, when this information is needed, for e.g. during illness investigations or when improving surveillance. Communications to producers should be carried out via the intermediary of processors whose contact details are available on harvest logs.

2.1.3. **Gap 3:** Information exchange between public health partners and industry representatives regarding *Vp* illnesses is not timely or consistent. Public health does not provide industry with human illness numbers to identify when *Vp* illnesses start, or to provide an early warning when an outbreak occurs. Public health agrees there is a need for industry and other partners to receive *Vp* illness surveillance numbers, and these should be based on verified surveillance data. The MARTOX reports are communicated outwards to all federally registered shellfish processing plants and others subscribing to the list. All growers and harvesters providing oysters for raw consumption to the commercial market must send their product through a federally registered processing plant.

Recommendation 34: BCCDC should provide weekly BC *Vp* surveillance illness numbers to CFIA for inclusion into MARTOX reports. Additional information can be included as required. This system of sharing illness numbers via MARTOX should be evaluated after 2016.

Recommendation 35: BC Ministry of Agriculture should encourage provincial shellfish processing facilities to subscribe to the MARTOX reports.

2.1.4. **Gap 4:** Industry does not provide public health with environmental information such as increased temperatures, *Vp* counts, volume, etc.

Recommendation 36: BCSGA should encourage processors to provide weekly confidential volume data reports to BCCDC. For more details, see recommendations 46 and 47 under 3.1.1.

Recommendation 37: CFIA should require processors to provide data.

2.1.5. **Gap 5:** Environment Canada was not included in OICC discussions.

Recommendation 38: The *Vp* Working Group should identify if partners external to the Working Group need to be involved in *Vp* control efforts, and collectively determine the most appropriate procedure for involving them.

2.2. Public Communication

2.2.1. **Gap 1:** Public communications are not shared among agencies before release for comment.

Recommendation 39: All agencies should provide advance notice to partners of any public communication. The notice would be to inform of a planned communication, but not necessarily

include or request a review of the communication. The advance notice may be delivered by an e-mail to the *Vp* Working Group for further distribution to all stakeholders as needed.

2.2.2. **Gap 2:** Not all BC restaurant menus advise customers of the risks of raw oyster consumption (currently only required in one HA area).

Recommendation 40: BCCDC should recommend to the BC Environmental Health Policy Advisory Committee to standardize menu warnings across BC.

2.3. Data sharing

2.3.1. **Gap 1**: Available data is not transparent throughout the control program, e.g. from highest level of regulator down to the harvester. During the 2015 *Vp* outbreak, the existing national Foodborne Illness Outbreak Response Protocol (FIORP) and Memorandum of Understanding (MOU) for data sharing were not sufficient to allow CFIA to share information during national OICC calls. Further, DFO and industry are not part of either the MOU or FIORP. In order to assess risk, BCCDC requires volume data, either from the regulator or directly from industry, to fairly assess the risk of a specific growing area, processor, or restaurant. This data is useful to look at where and when illness is and is not occurring (i.e. denominator data is required for risk assessment). Regulators have concerns about sharing industry data with other partners which could addressed by declaring to industry up front what the information will be collected for and who it will be shared with and why. There is also concern about sharing of data beyond partners (to third parties). Federally registered processors receive all oysters for raw consumption going to commercial market from growers and harvesters. Processors should collect and report this information. A method to ensure volume data is collected from processor purchase records is to incorporate this as a Quality Management Plan (QMP) requirement, or to make this a mandatory legislated requirement.

Recommendation 41: PHAC and BCCDC should educate the CFIA (at national and local level) about the MOU and FIORP agreements that describe data sharing during outbreak investigations.

Recommendation 42: PHAC to consider whether a new MOU or data sharing agreement should be developed between DFO and other government agencies for issues of common interest related to human health.

Recommendation 43: BCCDC and BCSGA should prepare a letter or data sharing agreement between BCCDC and each processor for the sharing of oyster production data[7].

Recommendation 44: CFIA should include into processor QMP requirements that:

- processors collect data on how many raw oysters for raw consumption are purchased from growers and harvesters on a weekly basis, and
- processors will report these numbers to BCCDC and CFIA.

Recommendation 45: CFIA should incorporate data collection and reporting requirements into regulations governing the management of oysters for raw consumption.

[7] The content of the letter or agreement may specify who will receive the data, who has access to the data, how it will be used, and include a statement that processor data will not be shared to 3rd parties without the processor prior consent. Specifics will be decided upon review

3. Outbreak Detection and Response

3.1. Illness surveillance

3.1.1. **Gap 1:** Unable to calculate illness incidence rates of growing areas, processors, and restaurants. Volumes harvested, processed, and consumed are unavailable. Volume data is useful for assessing relative risk along the distribution chain.

Recommendation 46: BCCDC should obtain retrospective oyster production volumes from government, shellfish industry and restaurant sources to calculate historical rates.

Recommendation 47: Processors should provide BCCDC with prospective weekly oyster production values by landfile and market destination (BC market vs elsewhere) to calculate current rates.

3.1.2. **Gap 2:** Current illness case form captures restaurant inspection data that is not used to inform action.

Recommendation 48: BCCDC should remove the restaurant inspection section from the case report form. Restaurant inspection data should still be collected and accessible if needed.

3.1.3. **Gap 3:** Surveillance indicators in 2015 (i.e. *Vp* oyster testing regime) was not an adequate indicator of potential risk to the population.

Recommendation 49: BCCDC should inform partners when overall BC human illness incidence is above expected. If sufficient data are available, BCCDC should calculate location-specific incidence rates and inform partners when rates are above expected.

3.1.4. **Gap 4:** Trace-back from shellfish tags do not include asking questions of the entire distribution chain (e.g., delivery and transport) and there is no standardized questionnaire for this purpose.

Recommendation 50: BCCDC should coordinate the development of a system to investigate loss of control at the farm to fork distribution chain when illness rates are above expected or a cluster in time or space occurs. Standardized questionnaires for this purpose should include:

- pre-harvest activity
- harvest activity
- delivery activity
- processor controls
- distribution route
- restaurant/retail

The questionnaires will identify the organization(s) responsible for specific investigations.

3.1.5. **Gap 5:** There is a lack of identification of specific risks along the food chain, coincident with a lack of response targeted to identified risks. This occurs when available data are not integrated, e.g., testing results at harvest and at processing. Historical and inherent risk in areas and practices are additional useful data that should be factored into illness assessments, into trend analysis for groups of cases, and to assess risk status during target inspections and audits. Historical and inherent risk examples in this context could be growing areas previously

associated with illness outbreaks, or recalls, or restaurants with temperature violations. Each of these examples indicates a loss of control and increased risk.

Recommendation 51: HA, BCCDC, CFIA should identify and share point(s) where loss of control occurred for each individual case, where possible. This will require improved traceback capacity, collation, standardization and an increase in data sharing.

Recommendation 52: BCCDC and CFIA should conduct and share analysis of groups of cases to identify trends and patterns in loss of control and commonalities in time and space (e.g. common restaurants, common lots, common land-files) using integrated data.

Recommendation 53: HA, BCCDC, CFIA and other responsible agencies should collate and share historical data on land-files, harvesters, processors, distributors and restaurants to identify higher risk entities. Knowledge can be used to assess risk status and target inspections/audits.

3.2. Outbreak response

3.2.1. **Gap 1:** Criteria for public health response are not clear, e.g., number of cases/over specified period of time/in a space.

Recommendation 54: BCCDC should develop and propose criteria to launch a *Vp* outbreak investigation:

- BC human incidence is above expected for that time of year
- Human illness is clustering in time or space

3.2.2. **Gap 2:** Illnesses associated with BC oysters outside of BC (e.g. in US, or international) weren't captured in the analysis of the 2015 outbreak.

Recommendation 55: CFIA and PHAC should collaborate with FDA, CDC, and state officials on a system to streamline notification of cases associated with BC products that occur outside of BC.

Recommendation 56: CFIA should inform BCCDC about human *Vp* cases associated with BC oysters occurring outside of BC in real time, and should develop a process to do this.

3.2.3. **Gap 3:** Control measures varied across health authority jurisdictions within BC in response to 2015 outbreak. BC public health partners agreed in 2015 debriefing to attempt to undertake common control measures.

Recommendation 57: BC public health partners should determine and implement if necessary and where possible, common control measures across health authorities. BCCDC and HAs should take further actions to complement other outbreak control measures if current measures are unable to control the outbreak.

3.3. Trace-back

3.3.1. **Gap 1:** The existing oyster tag process for illness associated with restaurant exposure produces too many tags for each illness, creates an excessive workload and makes it difficult to find the implicated product at the lease file level, e.g., does not provide the precision required to identify affected harvest area(s).

Recommendation 58: BCCDC should assess the frequency of single tag cases and correlation between single tag cases and multiple tag cases (i.e. how well one predicts the other).

Recommendation 59: If multiple tag cases are not useful or predictive, BCCDC should recommend that collection, transmission or use of this information be discontinued or limited.

Recommendation 60: CFIA should inform BCCDC and HAs of their position on the receipt and use of multiple tags per case (e.g. want to receive all tags but will only use subset, only want to receive tags if <4 tags/case).

3.3.2. **Gap 2:** Current traceback process relies on oyster tag collection which has limitations. Shellfish tag quality is sometimes too poor to allow traceback, and other information exist that could be collected improve traceback.

Recommendation 61: Shellfish tags received at the restaurant/retail levels should be durable, readable, and identify the most specific harvest site information as per Canadian Shellfish Sanitation Program requirement 7.3. BCCDC should investigate shellfish tags at restaurant/retail levels and provide recommendations for standardization and improvement of shellfish tag quality to CFIA for implementation with processors and distributors of shellfish.

Recommendation 62: BCCDC, in conjunction with HAs, should investigate the types of information restaurants receive with oyster shipments, as well as the information they generate that could be used in traceback investigations (e.g. oyster-specific information in customer receipts). Information will be assessed for its usefulness and recommendations made to enhance the investigation procedure.

3.3.3. **Gap 3:** Current restaurant practice of keeping all tags in a single envelope can lead to an excessive number of tags for a single illness.

Recommendation 63: BCCDC and the HAs should conduct an on-site survey of restaurants tag collections to inform how practices could be improved. This recommendation should be communicated to all restaurants via the HAs.

3.3.4. **Gap 4:** Not all restaurant receipts name the oysters that were consumed.

Recommendation 64: BCCDC and the HAs should conduct an on-site survey of restaurants customer receipts to assess if this information can be utilized during an investigation, and if this information can be incorporated into receipts for customers where this practice does not exist. Recommendations on changing practice should be communicated to all restaurants via the HAs.

4. Risk Management

4.1. Risk management trigger

4.1.1. **Gap 1:** The current trigger (i.e. date of May 1st) is not adequate for implementation of *harvester* risk management measures.

Recommendation 65: CFIA and industry should consider a risk management approach based on the following risk management triggers, which are classified into three levels:

A. Triggers for implementation of harvester/processor risk management plan for the *Vp* season:

START OF SEASON will be defined by:
a. Date = May 1st; or
b. Water or oyster meat temperature at point of harvest ≥15°C; or
c. Trends showing persistent levels of *Vp* at or near 100 *Vp* MPN/g, whichever comes first.

END OF SEASON[8] will be defined by:
a. Water or oyster meat temperature at point of harvest is consistently <15°C; and
b. *Vp* levels at point of harvest is consistently <3 *Vp* MPN/g.

B. Triggers for implementation of enhanced harvester/processor risk management plan for part of, or all of the *Vp* season:
a. *Vp* illnesses above expected in BC, as defined by the BCCDC, or
b. Changes in environmental conditions expected or occurring (e.g. warm weather or transitory incidents such as storms, dredging or construction, prior or during harvest), or
c. Trend analysis of product test results, during implementation of *Vp* controls, still indicating persistent levels near 100 MPN/g , or
d. Product testing results of ≥100 MPN/g , or
e. Product or environmental (e.g., water, sediment) testing results of potentially pathogenic strains of *Vp* (i.e., tdh, trh strains)

C. Triggers for implementation of immediate stringent harvester/processor risk management plan for all of the *Vp* season:
a. Epidemiologically linked illness(es) to a specific harvest/lease site area(s) or processor(s) where the food safety investigation did not indicate other issues in the cold chain.

Guidance on potential actions should also be obtained from the Codex document on Guidelines on the Application of General Principles of Food Hygiene to the Control of Pathogenic Vibrio Species in Seafood (CAC/GL 73-2010).

4.1.2. **Gap 2:** There is a lack of guidance for harvesters on what triggers can be considered for risk management resulting in lack of consistency (e.g., not all harvesters use water and oyster meat temperature tracking at harvest sites).

See recommendation 65 above.

[8] The date may vary depending on the harvest area location. For example, this may be around October 1 in a harvest area of British Columbia

4.1.3. **Gap 3:** Water temperature data is not easy to access. Water temperature data collected from harvest area sites at the shellfish farm harvest site is the best method for assessing temperature trends. Supplemental sources of data to assess temperature trends include publicly available temperature data sources[9]. Limitations of publicly available data are that they are based on satellite readings of the sea surface, and not at the depth of where oysters are grown; or temperature data from buoys, that may not be close to the harvest area of interest.

Recommendation 66: Industry shellfish farms should monitor water temperatures at their harvest sites to assess *Vp* risk.

Recommendation 67: BCCDC should collect and post satellite sea surface temperatures for selected harvest areas in BC on their public website to provide an indicator of temperature warming trends.

4.1.4. **Gap 4:** The value of water temperature monitoring to inform the implementation of risk management measures is unknown/unclear.

Recommendation 68: BCCDC should assess the value of water temperature monitoring as an early warning tool by assessing correlation with *Vp* counts, other environmental factors, and human illness and by developing a predictive model.

4.2. Identification of affected harvest area

4.2.1. **Gap 1:** Unable to assess whether there is increased risk associated with certain harvest areas, or within a certain harvest area (e.g., microenvironments), over time, limiting targeted response. Harvest tags that accompany shellfish from farm to retail can provide an indicator of site specific risk. However, when multiple tags (shellfish sources) are associated with shellfish illnesses it is not always possible to identify a single harvest area with the reported illness(es). When this situation occurs, harvest tag implication is not sufficient to identify, for certain, harvest area. This limits the ability to undertake targeted response at the harvest level.

Recommendation 69: BCCDC should analyze production data by lease site, harvest area and/or processor to look for disproportionate representation of certain lease sites (or harvest areas or processors) during human illness investigations.

Recommendation 70: Regulators should consider results of these analyses in order to implement a targeted response.

[9]For example, buoy data from the Meteorological Service of Canada. The buoys and the statistical areas they cover are: Buoy #C46131 (Sentry Shoal) for areas 13, 14 and 15; Buoy #C46146 (Halibut Bank) for areas 16 and 17 and Buoy #C46206 (La Perouse Bank) for area 23. Data available at http://nvs.nanoos.org/Explorer

EVALUATION OF MEASURES IMPLEMENTED DURING THE 2016 SEASON

The terms of reference for the National Working Group included a reference to review the effectiveness of the 2016 *Vp* controls. The Working Group undertook a brief brainstorming session to define metrics to evaluate the measures implemented based on their recommendations. This evaluation will take place after the 2016 *Vp* season, ideally in advance of the wash up meeting in November 2016.

Options for evaluating the implementation of the National Working Group recommendations are:

1) the number of National Working Group recommendations included in this report that were implemented, and proportion of recommendations implemented over time;
2) the number of prohibitions placed on the sale of raw BC oysters due to *Vp* illnesses;
3) the number of prohibitions placed on the sale of raw BC oysters due to non-compliant laboratory results; and
4) Comparison of the following contextual information to that of previous years:
    a. the number of reported laboratory-confirmed *Vp* cases associated with consumption of raw oysters;
    b. the number and outcome of *Vp* test results in raw oysters;
    c. water temperatures recorded throughout the *Vp* season;
    d. the number of enforcement actions carried out by DFO;
    e. the aggregated number of audits, recalls, non-compliances or inspections carried out by regulators;
    f. the number of SQAs implemented with growers;
    g. the number of SQAs validated by processors through on-site inspections of shellfish growing areas;
    h. the number of processor *Vp* harvest control programs validated by CFIA; and
    i. the outcomes of restaurant inspections, e.g., risk ratings, number of violations.

Options other than those listed may also be considered.

CONCLUDING REMARKS

The National Working Group for *Vibrio parahaemolyticus* Control in BC Oysters for Raw Consumption met every two weeks from January 15 to May 20, 2016. During these meetings, the Working Group fulfilled their goals by describing issues and gaps in the current *Vp* control program, largely based on the lessons learned from the 2015 *Vp* season, and collaboratively developing recommendations to allow safe product to reach the market. The Working Group recommendations are categorized in four main areas: Prevention and Control Measures; Communication; Outbreak Detection and Response; and Risk Management. A total of 70 recommendations were proposed by the Working Group under these four areas, some of which have already been implemented.

The National Working Group has agreed to reconvene following the 2016 *Vp* season for a debriefing 'hot-wash' and to evaluate the value of National *Vp* Working Group meetings. Criteria to evaluate the impact of Working Group recommendations on the number of human illnesses associated with BC raw oyster consumption as well as the outcome of *Vp* test results in BC raw oysters have been suggested.