**Epidemiological Assessment**

**Lead public health authority:** PHAC-OMD

**Version Date:** 2020-06-05

**Version Time:** 19:30 EDT

**Outbreak number and title:**2020-060 Multi-provincial *Salmonella* Newport outbreak

***Note****: Interpret and weigh the evidence for each criterion and summarise the supporting evidence below. Where the evidence is outlined and interpreted in the epidemiological summary, there is no need to duplicate it here. Refer the reader to the section of the epidemiological summary where the information can be found.*

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| **Brief Epidemiological Summary** (Refer to section of guide noted in the column at left)**:** |
| A.1 | Has a line list been provided to investigative team members including Health Canada (e.g., case ID, case confirmation status, age, sex, onset, food exposure and purchase details)? | [x]  Yes [ ]  No |
| A.2 | Has an epidemiological summary been provided to investigative team members including Health Canada? | [x]  Yes [ ]  No |
| A.3 | Is there is substantial evidence that cases represent a common source outbreak?*Briefly describe the evidence indicating cases represent a common source outbreak:*There are 16 confirmed cases of *Salmonella* Newport reported in AB (n=3), BC (n=5), ON (n=7) and QC (n=1). All 16 cases are genetically related by whole genome sequencing (WGS), by 0-6 wgMLST allele differences. This degree of variation indicates that all of these cases were exposed to the same specific strain of *Salmonella*. These data are consistent with the underlying biological principal that strains that are genetically the same or highly similar are more likely to have originated from a common source and thus provide strong evidence that this a common source outbreak.  |  |
| **Food Under Assessment:** |  |
| B.1 | Suspect food: Chia seeds |
| B.2 | Other levels of specificity if applicable/information available (e.g., common product details, purchase location, purchase dates, package type, brand, packager/distributor/manufacturer, lot code/best before date, etc.): * Two different brands of chia seeds packaged at one facility in a specific time interval: “Smile” brand (two lot codes) and “Nature’s Planet” brand (one lot code).
* Both brands were produced during the same time period (April 14-15, 2020) at one facility.
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| **Epidemiological Assessment Criteria and Considerations**  |
| C.1 | **Plausibility: The food is a plausible vehicle of infection.** *Provide supporting evidence:* | [x]  **Strong**[ ]  **Moderate**[ ]  **Weak** |
| * Is the food a known vehicle of infection for the outbreak pathogen?
 | [x]  Yes [ ]  No  |
| * Is there literature to indicate that the pathogen has been previously identified in the food type?
 | [x]  Yes [ ]  No |
| *If yes to either of the above two questions, no further explanation is required.* *If ‘No’ to both of the above questions, provide any available evidence in support of the food as a plausible vehicle of infection:* |
| C.2 | **Temporality: Cases report eating the food within their period of exposure.** *Provide supporting evidence:* | [x]  **Strong**[ ]  **Moderate**[ ]  **Weak** |
| * What was the time period used to assess case exposures during interviews?
 | 7 days |
| * Do any cases only report eating the suspect food outside of this time period?
 | [ ]  Yes [x]  No  |
| *If Yes, please explain.* |
| C.3 | **Consistency: The distribution of cases in time and place is consistent with the shelf-life and distribution of the food.** | [x]  **Strong**[ ]  **Moderate**[ ]  **Weak** |
| *Provide supporting evidence:*The distribution of the cases (BC=5, AB=3, ON=7, QC=1) correlates with the distribution of both implicated brands of chia seeds. The two brands have been distributed mainly in Ontario, but also in British Columbia, Alberta, and to a lesser extent in Quebec. No cases have been reported outside of provinces where the products have been distributed.The chia seeds were packaged in mid-April (April 14-15, 2020), and shipment to distribution centres (and subsequently grocery stores) started April 16, 2020. The onset of illness of the first case in this outbreak was on April 22, 2020. In addition, the onset dates for cases in Alberta and British Columbia occur later than Ontario, which aligns with the product distribution timing as it would have taken longer for the product to be available for retail sale in these provinces. |
| C.4 | **Consistency: The food exposure is consistently reported among cases.** | [x]  **Strong**[ ]  **Moderate**[ ]  **Weak** |
| *Provide supporting evidence:*Twelve of sixteen cases have been re-interviewed with a hypothesis-generating and/or focused questionnaire that specifically asked about chia seeds:* 10/12 cases reported consuming or probably consuming chia seeds in the seven days before illness onset.
* 2/12 cases did not report consuming chia seeds. Both cases reported consuming some meals on their university campus, but could not remember specific details. It is possible that the chia seeds were a hidden ingredient in food they consumed on campus or from another source they did not prepare themselves.

Based on case reporting, loyalty card records, and grocery store follow-up, “Smile” and “Nature’s Planet” brand chia seeds were identified for 6/10 re-interviewed cases that reported consuming or probably consuming chia seeds. * 2/6 cases reported eating “Smile” brand chia seeds. This was also confirmed via purchase records.
* 1/6 cases reported eating “Nature’s Planet” brand chia seeds
* 2/6 cases could not recall brand information, but “Smile” brand chia seeds were confirmed via purchase records
* 1/6 cases could not recall brand information, but the grocery store where they purchased their chia seeds confirmed that they sell “Smile” and “Nature’s Planet” brand chia seeds.

Brand information was unavailable for the other four casesOf the four cases that were not re-interviewed:* 3/4 cases were lost to follow-up so no exposure information was available
* 1/4 cases reported eating healthy foods, including smoothies. Further information was not available from the initial questionnaire and the case was not able to be contacted for re-interview.
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| C.5 | **Strength of association: A higher than expected proportion of cases report the food exposure.***Provide supporting evidence:** Has an analytical study been conducted?
* Do data exist that estimate the proportion of the general population who eat the food or similar foods (e.g., Foodbook, FoodNet Canada, FoodNet USA, other)?
 | [ ]  **Strong**[ ]  **Moderate**[x]  **Weak** |
| [ ]  Yes [x]  No[ ]  Yes [x]  No |
| *If ‘Yes’, provide further details. If ‘No’ provide any available evidence that suggests a higher than expected proportion of cases report the food exposure:*Food exposures reported by cases were compared with Foodbook data1. Comparison to chia seeds was not possible, as this exposure was not included in Foodbook. However, other seeds are reported in Foodbook that can be used as a proxy.* Approximately 17.1% and 18.3% of respondents in Foodbook reported eating sesame seeds and sunflower seeds, respectively, in the previous seven days.
* In this investigation, 83% (10/12) of cases reported consuming or probably consuming chia seeds.
* When this proportion is compared to Foodbook estimates for sesame seeds and sunflower seeds, the differences in proportions are statistically significant (p<0.05).

1Canada. Infectious Disease Prevention and Control Branch. Foodbook Report. Guelph: Public Health Agency of Canada; 2015 |
| C.6 | **Consideration of alternate explanations: Other plausible hypotheses have been adequately ruled out.** | [x]  **Strong**[ ]  **Moderate**[ ]  **Weak** |
| *Provide supporting evidence:*Exposure information from initial interviews conducted by local public health were available for 13/16 cases. Initial interviews asked about a variety of food, animal and environmental exposures the case may have consumed or had contact with in the seven days prior to illness onset. The specific questions asked and the level of detail provided differed by the questionnaire used and the recall of the case. Six cases were re-interviewed with the PHAC *Salmonella* hypothesis-generating questionnaire that asked about a wide range of common risk factors for *Salmonella* (poultry, eggs, travel, animal contact, etc.) and gathered more specificity than initial interviews. Five cases were re-interviewed with a focused questionnaire that asked more specific details about blueberries, nuts and seeds. One case was re-interviewed with both the hypothesis-generating and focused questionnaires.There were no common water, travel or zoonotic exposures identified among the cases. Exposures reported by cases were compared to reference levels1 and assessed for statistical differences using binomial probability. As such, the following alternative hypotheses were explored and ruled out during the investigation:Blueberries Blueberries were reported in higher frequency than expected compared to Foodbook. However, a smaller number of cases (6/13) reported them and there were no commonalities identified in brands or purchase locations. Further, one case reported a blueberry allergy.NutsThough Walnuts were reported in higher frequency than expected compared to Foodbook, a smaller number of cases (5/11) reported them. In addition, there were no commonalities identified in brands or purchase locations.Other SeedsWhile sesame seeds were reported in higher frequencies than expected, a smaller number of cases (6/12) reported them. Although reference data were not available for flax seeds, a high proportion of cases reported exposure to flax seeds (50%). In addition, there were no commonalities identified in brands or purchase locations. Spinach CFIA conducted traceback investigations for the baby spinach consumed by the three Ontario cases and one BC case. The spinach eaten by the Ontario cases was traced back to two distributors. Both distributors obtain spinach from a hydroponic greenhouse located in the province and only distribute product within Ontario. This greenhouse provides product to only these two distributors. As the spinach is not distributed outside of Ontario and the other cases are not reporting travel to Ontario, it is unlikely that the spinach is the source of the outbreak. Traceback conducted into the spinach consumed by the British Columbia case found that the particular store they purchased spinach from sources their produce from a farm that only distributes produce in Western Canada, so no further traceback was conducted. Because of the lack of commonalties between the spinach the sources consumed, spinach was ruled out as a likely source of these illnesses.1Canada. Infectious Disease Prevention and Control Branch. Foodbook Report. Guelph: Public Health Agency of Canada; 2015 |
| **Conclusion** |
| D | **Is there strong epidemiological evidence that chia seeds food] are the vehicle of infection for this outbreak?**  | **[x]  Yes** **[ ]  Additional evidence needed** |
| **State any additional conclusions that can be made regarding specific details of the suspect food (e.g., product, purchase locations, purchase time periods, origin of the food):*** Two BC cases reported purchasing their chia seeds at two different locations of Healthy Lifestyle Emporium. One case reported purchasing their chia seeds at a local independent grocery store.
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| **Briefly highlight any important gaps in the evidence:** * Four cases were lost to follow-up so no exposure information is available.
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| E | **Additional considerations:** * Samples of leftover chia seeds (one open and one closed package) have been collected from the homes of two cases. The lot code on the closed package matches the lot code on the package of chia seeds consumed by the case. Laboratory results are pending on these samples.
* Environmental samples from the facility, as well as samples of the implicated products, products packaged before and those packaged after the implicated time frame have been obtained. Laboratory results for these samples are pending.
* This cluster of cases is within 25 alleles of a historic cluster of four Ontario cases in 2019 (1908NEWWGS-1ON). The onset dates for this cluster ranged from August 8, 2019 to September 2, 2019. The source of this outbreak was never confirmed, although some type of nut or seed product was suspected.
* Two cases report vegetarian diets and one case reports a vegan diet
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