Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Viruses in Ready-to-Eat Fresh-Cut Fruits - April 1, 2017 to March 31, 2020

Food microbiology - Targeted surveys - Final report

Food microbiology targeted surveys, October 2020

Canada

Summary

Targeted surveys provide information on potential food hazards and enhance the Canadian Food Inspection Agency's (CFIA's) routine monitoring programs. These surveys provide evidence regarding the safety of the food supply, identify potential emerging hazards, and contribute new information and data to food categories where it may be limited or non-existent. They are often used by the agency to focus surveillance on potential areas of higher risk. Surveys can also help to identify trends and provide information about how industry complies with Canadian regulations.

Fresh-cut fruits are a popular food among Canadians as they provide a healthy and convenient way to meet Canada's food guide recommendation to eat plenty of fruits and vegetables. Unfortunately, a wide variety of produce including fresh-cut fruits have been implicated in food-borne illnesses and outbreaks. In Canada, among the food-borne pathogens (bacteria, viruses, parasites), Norovirus (NoV) is the leading cause of food-borne illnesses and hospitalizations and the second leading cause of death.

Fresh produce can be contaminated with viruses through contact with human waste and infected food handlers during growth, harvest, post-harvest handling, processing, packaging and distribution. The additional processing steps that fresh-cut fruits undergo as compared to whole produce such as peeling and cutting provide additional opportunities for contamination to occur. Unlike bacteria, viruses are unable to grow on foods, however they can remain viable for extended periods of time and may cause illness if ingested. Therefore, the presence of viruses on produce is of concern as produce makes up a significant part of the Canadian diet and is generally consumed raw or with minimal preparation.

Considering the information provided above and their relevance to Canadians, a 3-year survey (April 1, 2017 to March 31, 2020), was conducted to investigate the presence of viruses in pre-packaged, ready-to-eat (RTE) fresh-cut fruits. Throughout the 3-year survey period, a total of 1149 samples of fresh-cut fruits were collected from retail locations in 11 cities across Canada and tested for Hepatitis A Virus (HAV) and NoV (Genotype I and II (GI, GII)). HAV and NoV (GII) ribonucleic acid (RNA) were detected in 3/1149 (0.3%) and 2/1149 (0.2%) samples respectively.

The CFIA conducted appropriate follow-up activities for all viral RNA positive samples. For example, follow up inspections were conducted at processing facilities and in some cases corrective actions were implemented by the facilities. No product recalls were issued due to various reasons such as the inability to determine the source of the viral RNA and unavailability of product on the market. In addition, the analytical methods used to analyse the samples were unable to discriminate between infectious and non-infectious viral RNA rendering it difficult to

determine the immediate health significance of a viral RNA positive sample. There were no reported illnesses linked to the viral RNA positive samples.

Overall, our survey results suggest that fresh-cut fruits are generally safe for consumption. Regardless, as with all foods, and especially those that are consumed raw such as fresh produce, safe handling practices are recommended for producers, retailers and consumers.

What are targeted surveys

Targeted surveys are used by the CFIA to focus its surveillance activities on areas of highest health risk. The information gained from these surveys provides support for the allocation and prioritization of the Agency's activities to areas of greater concern. Originally started as a project under the Food Safety Action Plan, targeted surveys have been embedded in the CFIA's regular surveillance activities since 2013. Targeted surveys are a valuable tool for generating information on certain hazards in foods, identifying and characterizing new and emerging hazards, informing trend analysis, prompting and refining health risk assessments, highlighting potential contamination issues, as well as assessing and promoting compliance with Canadian regulations.

Food safety is a shared responsibility. The CFIA works with federal, provincial, territorial and municipal governments and provides regulatory oversight of the food industry to promote safe handling of foods throughout the food production chain. The food industry and retail sectors in Canada are responsible for the food they produce and sell, while individual consumers are responsible for the safe handling of the food they have in their possession.

Why did we conduct this survey

Fresh-cut fruits are a popular food among Canadians[1] as they as they provide a healthy and convenient way to meet Canada's food guide[2] recommendation to eat plenty of fruits and vegetables. Unfortunately, a wide variety of produce including fresh-cut fruits have been implicated in recalls[3] and food-borne illnesses and outbreaks[4, 5]. In Canada, among the food-borne pathogens (bacteria, viruses, parasites), Norovirus (NoV) is the leading cause of food-borne illnesses and hospitalizations and the second leading cause of death[6].

Fresh produce can be contaminated with viruses through contact with human and animal waste and infected food handlers during growth, harvest, post-harvest handling, processing, packaging and distribution. Unlike bacteria, viruses are unable to grow on foods, however they can remain viable for extended periods of time and may cause illness if ingested. Therefore, the presence of viruses on produce is of concern as produce makes up a significant part of the Canadian diet and is generally consumed raw or with minimal preparation.

Considering the information provided above and their relevance to Canadians, a 3-year survey (April 1, 2017 to March 31, 2020), was conducted to investigate the presence of viruses in pre-packaged, RTE fresh-cut fruits. Throughout the 3-year survey period, a total of 1149 samples of fresh-cut fruits were collected from retail locations in 11 cities across Canada and tested for HAV and NoV (GI, GII).

What did we sample

For this survey, a sample consisted of a single unit (individual consumer-size package(s)) from a single lot with a total weight of at least 250 grams. All samples were collected from national retail chains and local/regional grocery stores located in 11 major cities across Canada. These cities encompassed 4 geographical areas: Atlantic (Halifax and Saint John or Moncton), Quebec (Quebec City and Montreal), Ontario (Toronto and Ottawa), and the West (Vancouver, Kelowna or Victoria, Calgary, Saskatoon and Winnipeg). The number of samples collected from these cities was in proportion to the relative population of the respective areas. Samples were collected between April 1, 2017 and March 31, 2020. A variety of RTE, pre-packaged single types of fresh-cut fruits (excluding berries) were sampled. Samples included conventional and organic produce of domestic or imported origin.

What analytical methods were used and how were samples assessed

Samples were analyzed using CFIA internally-validated methods (table 1) that detect the presence of HAV and NoV (GI, GII) RNA.

At the time of writing this report, no assessment guidelines had been established in Canada for viruses in fresh produce. In addition, the analytical methods used to analyse the samples detect viral RNA and cannot discriminate between viable (potentially infectious) from non-viable (non-infectious) viruses. Consequently, the detection of viral RNA was assessed as investigative indicating that further consideration is warranted to determine which follow-up activities would be the most appropriate (table 1).

Table 1 - Analytical methods and assessment criteria for viruses in fresh-cut fruits

Viral analysis	Method number	Satisfactory	Investigative
Hepatitis A Norovirus (GI, GII)	CFIA-FVNRC-04 CFIA-FVNRC-05 CFIA-FVNRC-08	Not detected	Detected

What were the survey results

A total of 1149 samples of fresh-cut fruits were analysed for HAV and NoV (GI, GII). HAV and NoV (GII) RNA were detected in 3/1149 (0.3%) and 2/1149 (0.2%) samples respectively. Sample assessment results can be found in table 2.

Table 2 - Assessment results of fresh-cut fruit samples

Total number of samples	Satisfactory	Investigative HAV	Investigative NoV(GII)
1149	1144	3	2

Sample assessment results by product origin can be found in table 3.

Table 3 - Assessment results of fresh-cut fruit samples by product origin

Product origin	Satisfactory	Investigative	Total (%)
Domestic	15	0	15 (1.3)
Domestic and Import	10	0	10 (0.9)
Import	744	5	749 (65.2)
Unknown	375	0	375 (32.6)
Total (%)	**1144 (99.6)**	**5 (0.4)**	**1149 (100)**

Sample assessment results by product type can be found in table 4.

Table 4 - Assessment results of fresh-cut fruit samples by product type

Product type	Satisfactory	Investigative	Total (%)
Pineapple	341	5	346 (30.1)
Cantaloupe	201	0	201 (17.5)
Watermelon	200	0	200 (17.4)
Mango	172	0	172 (15.0)
Honeydew	101	0	101 (8.8)
Apple	84	0	84 (7.3)
Papaya	31	0	31 (2.7)
Kiwifruit	7	0	7 (0.6)
Orange	5	0	5 (0.4)
Piel de Sapo Melon	2	0	2 (0.2)
Total (%)	**1144 (99.6)**	**5 (0.4)**	**1149 (100)**

Details about each investigative sample are provided in table 5.

Table 5 - Detailed information about investigative fresh-cut fruit samples

Commodity	Virus RNA detected	Country of origin
Pineapple	HAV	United States Costa Rica Unknown (Imported)
Pineapple	NoV (GII)	Unknown (Imported) Unknown (Imported)

What do the survey results mean

In this survey over 99.5% (1144/1149) of the fresh-cut fruit samples analyzed were free of HAV and NoV (GI, GII) RNA. HAV and Nov (GII) RNA were detected in 3/1149 (0.3%) and 2/1149 (0.2%) samples respectively.

Prevalence studies of viruses in fresh fruit samples not related to an outbreak are very limited and of those studies, they are primarily focused on fresh berries. Our study excluded berries as this commodity was the focus of previous targeted surveys. One study published in 2011[7] investigated the presence of NoV (GI, GII) in 75 fruit samples of which 15 were mixed-fruit salads prepared in Belgium. Nov (GI) RNA was not detected in any of the mixed-fruit salad samples (0/15) while NoV (GII) RNA was detected in 1/15 (6.7%) of the samples. The difference in the NoV positive rates observed between the CFIA and Belgian study may be attributable to differences in product type, detection methodology, as well as agricultural practices.

The CFIA conducted appropriate follow-up activities for all viral RNA positive samples. For example, follow up inspections were conducted at processing facilities and in some cases corrective actions were implemented by the facilities. No product recalls were issued due to various reasons such as the inability to determine the source of the viral RNA and unavailability of product on the market. In addition, the analytical methods used to analyse the samples were unable to discriminate between infectious and non-infectious viral RNA rendering it difficult to determine the immediate health significance of a viral RNA positive sample. There were no reported illnesses linked to the viral RNA positive samples.

Overall, our survey results suggest that fresh-cut fruits are generally safe for consumption. Regardless, as with all foods, and especially those that are consumed raw such as fresh produce, safe handling practices are recommended for producers, retailers and consumers.

References

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