



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Parasites in Imported Fresh Berries - April 1, 2017 to March 31, 2022

Food microbiology - Targeted surveys - Final report



Summary

A targeted survey¹ analysed 1782 samples of imported fresh berries over a 5-year period from April 1, 2017 to March 31, 2022. All samples were tested for the presence of *Cyclospora cayetanensis* (*C. cayetanensis*) while 1143 samples were also tested for *Cryptosporidium* species (spp.) and *Toxoplasma gondii* (*T. gondii*).

99.9% of the samples tested were found to be satisfactory. *Cryptosporidium* spp. and *T. gondii* were not found in any samples. *C. cayetanensis* was found in 2 of the 1782 (0.1%) samples. The Canadian Food Inspection Agency (CFIA) conducted appropriate follow-up activities and a food recall was issued by industry. There were no reported illnesses related to these products.

Overall, our survey results indicate that imported fresh berries sold in Canada are generally safe for consumption, however they can occasionally be contaminated. Consequently, as with all foods, and especially with those that are consumed raw, good hygienic practices are recommended for producers, retailers, and consumers.

Why was this survey conducted

The survey was conducted to provide enhanced oversight of the safety of imported fresh berries sold at retail in Canada. Fresh berries are popular among Canadians² as they provide a healthy and convenient way to meet the Canada's food guide³ recommendation to eat plenty of fruits and vegetables. Unfortunately, a wide variety of produce including berries have been associated with recalls⁴ and foodborne illness outbreaks^{5,6}.

Fresh produce, including berries can be contaminated with parasites through contact with human and animal waste at any step in the food supply chain such as during production, harvest, post-harvest handling, packaging, distribution, and/or at retail. Unlike bacteria, parasites are unable to grow on foods, however they can remain viable for extended periods of time and may cause illness when ingested. Therefore the presence of parasites on fresh berries is of concern as they make up a significant part of the Canadian diet and are generally consumed raw.

When was the survey conducted

The survey is ongoing, however the results reported herein are for samples collected over a 5-year period from April 1, 2017 to March 31, 2022.

Where were the samples collected from

Samples were collected from national retail chains and local/regional grocery stores located in the following 11 major cities across Canada:

- Halifax
- Moncton or Saint John
- Quebec City
- Montreal
- Toronto
- Ottawa
- Vancouver
- Victoria or Kelowna
- Calgary
- Saskatoon
- Winnipeg

The planned number of samples to be collected from each city was based on the population of the province in which the city was located relative to the total population of Canada.

How many and what kind of samples were collected

A total of 1782 pre-packaged imported berries were collected. The scope of sampling included strawberries, blueberries, blackberries, and raspberries. Samples were collected throughout the year, however a higher proportion was sampled during the months of April to October to reflect the seasonality of foodborne parasitic infections in endemic countries^{7,8,9}, imports into Canada, and reported cases of cyclosporiasis in Canada. A sample consisted of a single or multiple consumer sized packages of the same lot weighing at least 250g.

What were the samples tested for

All 1782 samples were tested for *C. cayentanensis*. Of the 1782 samples, 1143 were also analysed for *Cryptosporidium* spp., and *T. gondii*.

What methods were used to test the samples

Samples were analyzed using methods that detect the presence of deoxyribonucleic acid (DNA) of *C. cayentanensis*, *Cryptosporidium* spp., and *T. gondii*

How were the samples assessed

There are currently no Canadian standards regarding the presence of parasites in fresh produce. As the analytical methods used in this survey can only determine the presence or absence of parasite DNA, they cannot discriminate between living (infectious) and dead (non-infectious) parasites. Therefore, the detection of parasite DNA was assessed as “investigative” and required further consideration to determine appropriate follow-up actions.

Table 1 - Assessment criteria

Parasite	Satisfactory	Investigative
<i>C. cayetanensis</i>	Not detected	Detected
<i>Cryptosporidium</i> spp.	Not detected	Detected
<i>T. gondii</i>	Not detected	Detected

What were the survey results

Cryptosporidium spp. and *T. gondii* DNA were not found in any samples. *C. cayetanensis* DNA was found in 2 of the 1782 (0.1%) samples.

Table 2 - Assessment results

Parasite	Number of samples tested	Satisfactory (%)	Investigative (%)
<i>C. cayetanensis</i>	1782	1780	2
<i>Cryptosporidium</i> spp ^a			0
<i>T. gondii</i> ^a			0
Total	1782	1780 (99.9)	2 (0.1)

^a Tested in 1143 samples.

Survey results are also presented by production practice (table 3), origin (table 4), product type (table 5), and season sampled (table 6).

Table 3 - Assessment results by production practice

Production practice	Number of samples tested (%)	Satisfactory	Investigative
Conventional	1452 (81.5)	1450	2
Organic	330 (18.5)	330	0
Total	1782	1780	2

Table 4 - Assessment results by product origin

Product origin	Number of samples tested (%)	Satisfactory	Investigative
Argentina	25 (1.4)	25	0
Chile	79 (4.4)	79	0
Guatemala	1 (0.06)	1	0
Mexico	479 (26.9)	479	0
Peru	120 (6.7)	120	0
United States	1075 (60.3)	1073	2
Uruguay	3 (0.2)	3	0
Total	1782	1780	2

Table 5 - Assessment results by product type

Product type	Number of samples tested (%)	Satisfactory	Investigative
Blackberry	343 (19.3)	342	1
Blueberry	536 (30.1)	535	1
Raspberry	195 (10.9)	195	0
Strawberry	708 (39.7)	708	0
Total	1782	1780	2

Table 6 - Assessment results by season sampled

Season	Number of samples tested (%)	Satisfactory	Investigative
Spring (March to May)	439 (24.6)	439	0
Summer (June to August)	547 (30.7)	546	1
Fall (September to November)	503 (28.2)	502	1
Winter (December to February)	293 (16.4)	293	0
Total	1782	1780	2

What do the survey results mean

A previous Canadian¹⁰ study on the microbial safety of retail fresh berries has shown results approximating those found in this study.

Overall, our survey results indicate that imported fresh berries sold in Canada are generally safe for consumption, however they can occasionally be contaminated. Consequently, as with all foods, and especially with those that are consumed raw, good hygienic practices are recommended for producers, retailers, and consumers.

What is done with the survey results

All results are used to:

- inform risk management decisions
- support program design, and re-design

While no illnesses were related to the investigative samples, these results triggered appropriate follow-up actions including a food safety investigation and recall⁴.

Can I access the survey data

Yes. The data will be accessible on the [Open Government Portal](#).

References

1. Canadian Food Inspection Agency, [*Food chemistry and microbiology*](#).
2. Public Health Agency of Canada, [*Foodbook Report*](#). 2015.
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4. Canadian Food Inspection Agency, [*Food Recall Warning – Dole brand Fresh Packed Blueberries recalled due to Cyclospora*](#). 2021.
5. Tefera, T. et al., [*Parasite contamination of berries: Risk, occurrence, and approaches for mitigation*](#). Food Waterborne Parasitology. 2018. 10:p. 23-38.
6. Gomez-Marin, Jorge, [*Multicriteria-based ranking for risk management of food-borne parasites*](#). 2014.
7. Muchiri J.M., et al., [*Seasonality of Cryptosporidium oocyst detection in surface waters of Meru, Kenya as determined by two isolation methods followed by PCR*](#). Journal of Water and Health. 2009. Mar;7(1): p.67-75.
8. FAO/WHO, [*Multicriteria-Based Ranking for Risk Management of Food-Borne Parasites*](#). Microbiological Risk Assessment Series (MRA) 23. 2014.
9. Public Health Agency of Canada, [*Causes of cyclosporiasis \(Cyclospora\)*](#). 2016.
10. Canadian Food Inspection Agency, [*2011-2013 Cyclospora cayetanensis and Cryptosporidium spp. in Fresh Produce*](#). 2016.