



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Bacterial pathogens and indicators in fresh whole hot peppers - April 1, 2022, to March 31, 2025

Food microbiology - Targeted surveys - Final report



© His Majesty the King in Right of Canada, as represented by the Minister of Health, 2026.

Catalogue No.: A104-701/2026E-PDF

ISBN: 978-0-660-98677-7

Aussi disponible en français.

Page **2** of **9**

Summary

A targeted survey¹ analyzed 854 samples of fresh whole hot peppers over a 3-year period from April 1, 2022, to March 31, 2025, for the presence of the pathogens *Salmonella* spp. and *E. coli* O157. All samples were also tested for generic *E. coli*, which is used as an indicator of the overall hygienic and sanitary conditions of the food supply chain from production to the point of sale.

Of the 854 samples tested, the majority (97.7%) were found to be satisfactory. *E. coli* O157 was not found in any of the samples. *Salmonella* spp. was detected in 2 of the 854 (0.2%) samples tested. Generic *E. coli* at elevated ($10^2 < x \leq 10^3$ most probable number (MPN)/g) levels were found in 12 (1.4%) of the 854 samples tested. Generic *E. coli* at high ($> 10^3$ MPN/g) levels were found in 6 (0.7%) of the 854 samples tested. The Canadian Food Inspection Agency (CFIA) conducted appropriate follow-up activities including the oversight of an industry led voluntary food recall. There were no reported illnesses related to these products.

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

Why the survey was conducted

This survey was conducted to generate baseline information on the quality and safety of fresh whole hot peppers sold at retail in Canada.

Hot peppers have in recent years grown in popularity in Western countries including Canada as people continue to embrace foods and flavours of cuisines from different parts of the world. Hot peppers are a versatile ingredient and are used in a multitude of cuisines. They are also known for their purported health benefits such as cancer fighting effects, as a digestive aid, for pain relief, etc.

Many varieties of domestic and imported hot peppers are available on the Canadian retail marketplace. They are commonly consumed cooked; however, many hot peppers are also often eaten raw.

Unfortunately, hot peppers have been associated with recalls² and foodborne illness outbreaks^{3,4}. Contamination with bacterial pathogens can occur at any step in the food supply chain such as during primary production, harvest, processing, packaging, distribution, at retail and/or during preparation for consumption. Consequently, if pathogens are present, there is a potential for foodborne illness as fresh hot peppers may be consumed raw.

When the survey was conducted

The survey was conducted over a 3-year period from April 1, 2022, to March 31, 2025.

Where the samples were 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
- Quebec City
- Montreal
- Ottawa
- Toronto
- Winnipeg
- Saskatoon
- Calgary
- Vancouver
- Victoria

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.

Total number and description of samples collected

A total of 854 fresh whole hot pepper samples were collected. Preference was given to the collection of pre-packaged samples; however bulk samples were also collected. A sample consisted of a single or multiple consumer sized packages of the same lot weighing at least 250 g.

What the samples were tested for

All samples were tested for *Salmonella* spp., *E. coli* O157, and generic *E. coli*. *Salmonella* spp. and *E. coli* O157 are pathogenic bacteria while generic *E. coli* is an indicator of the overall hygienic and sanitary conditions under which the samples have been produced, processed, stored, and transported.

Methods used to test the samples

Samples were analyzed using analytical methods published in Health Canada's *Compendium of Analytical Methods for the Microbiological Analysis of Foods*⁵ that were appropriate for the testing of hot peppers.

How the samples were assessed

The samples were assessed using criteria based on the principles of Health Canada's *Health Products and Food Branch Standards and Guidelines for Microbiological Safety of Food – An Interpretive Summary*⁶, and the *Food and Drugs Act*⁷ (Section 4(1)).

Table 1 - Assessment criteria

Bacteria	Satisfactory	Investigative	Unsatisfactory
<i>Salmonella</i> spp.	Not detected/25 g	Not applicable	Detected/25 g
<i>E. coli</i> O157	Not detected/25 g	Not applicable	Detected/25 g
Generic <i>E. coli</i>	≤ 10 ² MPN/g	>10 ² and ≤10 ³ MPN/g	>10 ³ MPN/g

No assessment guidelines had been established in Canada for the presence of *Salmonella* spp. in fresh whole hot peppers at the time of writing this report.

As *Salmonella* spp. are considered pathogenic to humans, their presence might be considered a violation of the *Food and Drugs Act*⁷ Section 4(1)a and therefore assessed as unsatisfactory.

Survey results

Of the 854 samples tested, 97.7% (n=834) were found to be satisfactory. *E. coli* O157 was not found in any of the samples. *Salmonella* spp. was detected in 0.2% (n=2) of the samples. Generic *E. coli* at elevated (10² < x ≤ 10³ MPN/g) and high (> 10³ MPN/g) levels were found in 1.4% (n=12) and 0.7% (n=6) of the samples respectively.

Table 2 – Analysis assessment results

Bacterial analysis	Number of samples tested	Satisfactory	Investigative (%)	Unsatisfactory (%)
<i>Salmonella</i> spp.	854	852	Not applicable	2 ^a (0.2)
<i>E. coli</i> O157	854	854	Not applicable	0
Generic <i>E. coli</i>	854	836	12 ^b (1.4)	6 ^c (0.7)

^a Thai chili peppers imported from Vietnam and the Dominican Republic

^b Cayenne chili imported from Vietnam, Dominican Republic and unknown country. Thai chili imported from Vietnam (4 samples), Dominican Republic (4 samples), and Thailand.

^c Scotch bonnet pepper imported from the Dominican Republic. Thai chili peppers imported from Vietnam, Mexico, and the Dominican Republic (3 samples)

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

Table 3 - Assessment results by production practice

Production practice	Number of samples tested (%)	Satisfactory	Investigative	Unsatisfactory
Conventional	842 (98.6)	822	12	8
Organic	12 (1.4)	12	0	0
Total (%)	854 (100)	834 (97.7)	12 (1.4)	8 (0.9)

Table 4 - Assessment results by country of origin

Country of origin	Number of samples tested (%)	Satisfactory	Investigative	Unsatisfactory
Canada	69 (8.1)	69	0	0
Canada, Dominican Republic, Mexico, United States	2 (0.2)	2	0	0
Cuba	1 (0.1)	1	0	0
Dominican Republic	95 (11.1)	85	5	5
Jamaica	2 (0.2)	2	0	0
Republic of Korea	3 (0.4)	3	0	0
Mexico	232 (27.2)	231	0	1
Netherlands	14 (1.6)	14	0	0
Spain	17 (2.0)	17	0	0
Spain, Holland	1 (0.1)	1	0	0
Spain, Netherlands, Dominican Republic	1 (0.1)	1	0	0
Thailand	11 (1.3)	10	1	0
United States	182 (21.3)	182	0	0
United States, Mexico	2 (0.2)	2	0	0
United States, Mexico, Dominican Republic	6 (0.7)	6	0	0
Vietnam	83 (9.7)	76	5	2
Unknown ^d	133 (15.6)	132	1	0
Total (%)	854 (100)	834 (97.7)	12 (1.4)	8 (0.9)

^d Country of origin could not be assigned from the product label or available sample information.

Table 5 - Assessment results by product type

Product type	Number of samples tested (%)	Satisfactory	Investigative	Unsatisfactory
Aji Amarillo chili	18 (2.1)	18	0	0
Anaheim chili	11 (1.3)	11	0	0
Banana chili	6 (0.7)	6	0	0
Bhut Jolokia	6 (0.7)	6	0	0
Carolina reaper	1 (0.1)	1	0	0
Cayenne chili	120 (14.1)	117	3	0
Cherry bomb chili	1 (0.1)	1	0	0
Chile Gueros (Yellow Caribe chili)	13 (1.5)	13	0	0
Fresno chili	12 (1.4)	12	0	0
Habanero	44 (5.2)	44	0	0
Hot chili	31 (3.6)	31	0	0
Hungarian chili	5 (0.6)	5	0	0
Jalapeno chili	253 (29.6)	253	0	0
Jwala finger hot chili	39 (4.6)	39	0	0
Korean chili	2 (0.2)	2	0	0
Little hotties chili	2 (0.2)	2	0	0
Mixed	1 (0.1)	1	0	0
Poblano chili	39 (4.6)	39	0	0
Portugal chili	1 (0.1)	1	0	0
Scotch bonnet	32 (3.7)	31	0	1
Serrano chili	34 (4.0)	34	0	0
Shishito chili	20 (2.3)	20	0	0
Thai chili	163 (19.1)	147	9	7
Total (%)	854 (100)	834 (97.7)	12 (1.4)	8 (0.9)

What the survey results mean

A previously published international study⁸ on the microbiological quality and safety of retail fresh whole hot peppers has shown similar (*E. coli* O157) and lower prevalence rates (*Salmonella* spp., generic *E. coli*) when compared to this present study. Another previously published international study⁹ on the microbiological quality and safety of retail fresh whole hot peppers has shown a higher *Salmonella* spp. prevalence rate when compared to this present study. Differing prevalence rates between studies may be attributable to differences in product types tested, methodology, study design, etc.

Overall, our survey results indicate that fresh whole hot peppers sold in Canada are generally safe for consumption, however they can occasionally be contaminated. Consequently, as with all foods, and especially with those that may be 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

No illnesses have been reported related to the unsatisfactory samples. The unsatisfactory samples triggered appropriate follow-up activities including food safety investigations and a recall¹⁰.

Where to access the survey data

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

References

1. Canadian Food Inspection Agency, [Food microbiology](#).
2. Canadian Food Inspection Agency, [Recalls and safety alerts](#). 2024.
3. Hassan, Rashida et al., [Multistate Outbreak of Salmonella Anatum Infections Linked to Imported Hot Peppers - United States, May-July 2016](#). MMWR Morb Mortal Wkly Rep. 2017. Jun 30;66(25):663-667. Erratum in: MMWR Morb Mortal Wkly Rep., 2017. Aug 11;66(31):838.
4. Barton Behravesh, C., et al., [2008 outbreak of Salmonella Saintpaul infections associated with raw produce](#). N Engl J Med, 2011. Mar 10;364(10):918-27.
5. Health Canada, [Compendium of Analytical Methods](#). 2011.
6. Health Canada, [Health Products and Food Branch \(HPFB\) Standards and Guidelines for Microbiological Safety of Food - An Interpretive Summary](#). 2008.
7. Health Canada, [Food and Drugs Act \(R.S.C., 1985, c. F-27\)](#). 1985.
8. Su Y. et al., [Evaluation of the Microbiological Quality of Fresh Cilantro, Green Onions, and Hot Peppers from Different Types of Markets in Three U.S. States](#). *Horticulturae*, 2021. 7(6):122.
9. Cárdenas C. et al., [Evaluation of microbial contamination of tomatoes and peppers at retail markets in Monterrey, Mexico](#). J Food Prot., 2013. Aug;76(8):1475-9.
10. Canadian Food Inspection Agency, [Simply Hot brand Thai Green Peppers recalled due to Salmonella](#). 2023.