



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Bacterial Pathogens and Indicators, Viruses and Parasites in Various Food Commodities - April 1, 2016 to March 31, 2020

Food microbiology - Targeted surveys - Interim report



Food microbiology targeted surveys – February 2021

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.

While the food we eat in Canada is among the safest in the world, the consumption of food contaminated with foodborne pathogens (bacteria, viruses and parasites) can cause foodborne illness. It has been estimated that approximately 4 million (1 in 8) Canadians are affected by foodborne illnesses each year.

Targeted surveys are 1 of several surveillance activities that the CFIA conducts on the Canadian food supply. The purpose of targeted surveys is to generate baseline information on the occurrence of pathogens in food. Targeted surveys can vary in duration from several months to several years depending on the objective of each survey.

The food commodities included in this report are commonly consumed by Canadians across various age groups. Unfortunately, most of these types of foods have been associated with recalls and outbreaks of foodborne illnesses. There are numerous points in the food production chain where contamination with pathogens can occur such as during production, processing, packaging and distribution. Given that most of the commodities covered by this report are consumed without further preparation, the presence of pathogens creates a potential risk for foodborne illnesses.

The purpose of this interim report is to provide preliminary results related to on-going surveys that the CFIA is currently conducting on the following commodities:

- pasteurized cheese
- milk
- raw ground meat
- ready-to-eat (RTE) meat
- RTE fish and seafood
- fresh fruits and vegetables
- processed fruits
- plant-based milk, cheese and ice cream
- powdered spices

From April 1, 2016 to March 31, 2020, 21,626 samples of the above listed commodities were collected from retail locations in 11 cities across Canada and tested for various pathogens and

indicator organisms. Interim results show that almost all (98.2%, 21,230/21,626) of the samples were assessed as satisfactory, while 1.7% (374/21,626) were assessed as investigative and 0.1% (20/21,626) were assessed as unsatisfactory. Most of the surveys covered in this report have a >95% satisfactory rate to date, with the only exceptions being:

- frozen raw coconut meat
- milk from animals other than cows
- raw ground meats (beef, veal, lamb)

CFIA conducted appropriate follow-up activities for samples that were assessed as investigative or unsatisfactory. These follow-up activities may have included additional facility inspections, product recalls and additional sampling. There have been no reported illnesses linked to the contaminated products.

It is important to note that all results reported herein are considered preliminary, as the targeted surveys are still ongoing. Final reports, which will include a detailed analysis of the targeted survey results, will be shared over the next few years as the surveys are completed.

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. 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.

What is an interim report

Targeted surveys can vary in duration from several months to several years depending on the objective of each survey. The purpose of this interim report is to provide preliminary results related to on-going surveys that the CFIA is currently conducting.

Will the CFIA publish final reports

Yes, upon conclusion of the surveys, final reports will be made publically available on the CFIA website.

What foods were tested and why

A variety of foods of each of the following commodities were selected for targeted surveys to gather baseline information on the occurrence of pathogens (bacteria, viruses and parasites):

- pasteurized cheese
- milk
- raw ground meat
- RTE meat
- RTE fish and seafood
- fresh fruits and vegetables
- processed fruits
- plant-based milk, cheese and ice cream
- powdered spices

The selected foods are all commonly consumed by Canadians of all ages¹. Unfortunately, most of these commodities have been associated with recalls and outbreaks of foodborne illnesses, as they can become contaminated with pathogens during various points in the food production process (production, processing, packaging, distribution). Given that most of the commodities covered by this report are consumed without further preparation, the presence of pathogens creates a potential risk for foodborne illnesses.

When and from where did we sample

A sample consisted of a single or multiple unit(s) (individual consumer-size package(s)) from a single lot with a total weight of at least 250 g. All samples were collected from national retail chains and local/regional grocery stores located in 11 major cities across Canada. The number of samples collected from these cities was in proportion to the relative population of the respective areas. These cities encompassed 4 geographical areas:

- Atlantic (Halifax and Saint John or Moncton)
- Quebec (Quebec City and Montreal)
- Ontario (Toronto and Ottawa)
- West (Vancouver, Kelowna or Victoria, Calgary, Saskatoon and Winnipeg)

This report covers a period of 4 fiscal years (2016-2017, 2017-2018, 2018-2019 and 2019-2020) with a fiscal year being a 12 month period from April 1 to March 31 of the following year.

What analytical methods were used to test the samples and how were the samples assessed

Samples were analyzed using methods published in Health Canada's *Compendium of Analytical Methods for the Microbiological Analysis of Foods*² and CFIA internally-developed methods.

The assessment criteria (table 1, table 2, table 3) are based on the principles of the following Health Canada documents: *Health Products and Food Branch (HPFB) Standards and Guidelines for Microbiological Safety of Food – An Interpretive Summary*³, *Policy on Listeria monocytogenes in Ready-to-Eat Foods*⁴ and *Guidance Document on E. coli O157:H7 and E. coli O157:NM in Raw Beef*⁵. In the absence of Health Canada standards, policies or guidelines, the assessment criteria are based on other international food safety authorities' microbiological guidelines⁶⁻¹⁰. Detailed information about the assessment criteria used for each commodity will be provided in the final reports which will be published after the surveys have concluded.

Table 1. Assessment criteria for indicator organisms

Analysis	Product(s)	Satisfactory assessment	Investigative assessment	Unsatisfactory assessment
Aerobic Colony Count (ACC)	Milk from animals other than cows Plant-based milk Plant-based ice cream	$\leq 10^6$ CFU/g or mL	$> 10^6$ CFU/g or mL	Not Applicable (N/A)
ACC	Frozen raw coconut meat	$\leq 10^4$ CFU/g	$> 10^4$ CFU/g	N/A
Total coliforms	Milk from animals other than cows Plant-based milk Plant-based ice cream	$\leq 10^3$ CFU or MPN/g or mL	$> 10^3$ CFU or MPN/g or mL	N/A
Generic <i>Escherichia coli</i> (<i>E. coli</i>)	Pasteurized cheese	$\leq 10^2$ CFU or MPN/g	$> 10^2$ and $\leq 2 \times 10^3$ CFU or MPN/g	$> 2 \times 10^3$ CFU or MPN/g
Generic <i>E. coli</i>	RTE lunch meat RTE liver pâté RTE sausage Fresh vegetables Dried spices RTE fish and seafood	$\leq 10^2$ CFU or MPN/g	$> 10^2$ and $\leq 10^3$ CFU or MPN/g	$> 10^3$ CFU or MPN/g
Generic <i>E. coli</i>	Frozen raw coconut meat Dried grated coconut Raw meat Plant-based cheese	$\leq 10^2$ CFU or MPN/g	$> 10^2$ CFU or MPN/g	N/A
Generic <i>E. coli</i>	RTE chicken or turkey breast strips	≤ 10 CFU or MPN/g	> 10 and $\leq 10^3$ CFU or MPN/g	$> 10^3$ CFU or MPN/g

Table 2. Assessment criteria for pathogenic bacteria

Analysis	Product(s)	Satisfactory assessment	Investigative assessment	Unsatisfactory assessment
<i>Bacillus cereus</i> (<i>B. cereus</i>)	Dried ground spices	$\leq 10^4$ CFU/g	$>10^4$ and $\leq 10^6$ CFU/g	$>10^6$ CFU/g
<i>B. cereus</i>	Dried grated coconut	$\leq 10^6$ CFU/g	$>10^6$ CFU/g	N/A
<i>Clostridium perfringens</i> (<i>C. perfringens</i>)	Dried ground spices	$\leq 10^4$ CFU/g	$>10^4$ and $\leq 10^6$ CFU/g	$>10^6$ CFU/g
<i>C. perfringens</i>	Dried grated coconut	$\leq 10^6$ CFU/g	$>10^6$ CFU/g	N/A
<i>E. coli</i> O157	All products tested for <i>E. coli</i> O157	Not detected	N/A	Detected
Non-O157 Verotoxigenic <i>E. coli</i> (VTEC)	All products tested for non-O157 VTEC	Not detected	Detected	N/A
<i>Listeria monocytogenes</i> (<i>L. monocytogenes</i>)	Category 1 products ^a	Not detected	N/A	Detected
<i>L. monocytogenes</i>	Category 2A and B products ^a	Not detected	Detected and $\leq 10^2$ CFU/g	$>10^2$ CFU/g
<i>L. monocytogenes</i>	Fresh baby leafy vegetables Sprouts Microgreens	Not detected	Detected	N/A
<i>Salmonella</i>	Ground veal Ground lamb	Not detected	Detected	N/A
<i>Salmonella</i>	All other products tested for <i>Salmonella</i>	Not detected	N/A	Detected
<i>Staphylococcus aureus</i> (<i>S. aureus</i>)	Dried grated coconut Plant-based cheese	$\leq 10^4$ CFU/g	$>10^4$ CFU/g	N/A
<i>S. aureus</i>	All other products tested for <i>S. aureus</i>	$\leq 10^2$ CFU/g	$>10^2$ and $\leq 10^4$ CFU/g	$>10^4$ CFU/g

^aInformation such as pH, water activity and shelf life were used to determine product category.

Table 3. Assessment criteria for viruses and parasites

Analysis	Product(s)	Satisfactory assessment	Investigative assessment	Unsatisfactory assessment
<i>Cryptosporidium</i> ^b <i>Cyclospora</i> ^b <i>Toxoplasma</i> ^b Hepatitis A Virus (HAV) ^b Norovirus Genotype (I and II) (NoV (GI and GII)) ^b	All products tested for parasites and viruses	Not detected	Detected	N/A

^bThe methods cannot discriminate between potentially infectious and non-infectious viruses or parasites.

How many samples were tested, what were they tested for and what were the results

Details about each targeted survey and test results (as of March 31, 2020) can be found in table 4.

Table 4. Survey results as of March 31, 2020

Fiscal year(s)	Product	Microorganisms tested	Number of samples tested	Satisfactory (S)	Investigative (I)	Unsatisfactory (U)	Comments
2019/2020	Non-cow animal milk pasteurized cheese	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	121	121	0	0	All satisfactory
2019/2020	Medium or hard pasteurized cheese	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	289	289	0	0	All satisfactory
2018/2019 2019/2020	Shredded pasteurized cheese	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	896	896	0	0	All satisfactory
2018/2019 2019/2020	Single serve pasteurized cheese	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	592	592	0	0	All satisfactory
2018/2019 2019/2020	Sliced pasteurized cheese	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	891	891	0	0	All satisfactory
2018/2019 2019/2020	Soft pasteurized cheese with spices	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	873	872	0	1	U= <i>L. monocytogenes</i>
2019/2020	Milk from animals other than cows	<i>L. monocytogenes</i> ACC Total coliforms <i>Salmonella</i>	120	97	23	0	I=ACC (21) I= ACC & total coliforms (2)
2016/2017	Ground beef	VTEC	589	582	7	0	I=non-O157 VTEC
2017/2018 2018/2019 2019/2020	Ground veal	<i>E. coli</i> O157 VTEC Generic <i>E. coli</i> <i>Salmonella</i>	1128	1041	83	3	I=non-O157 VTEC (45) I=non-O157 VTEC & Generic <i>E. coli</i> (7) I= <i>Salmonella</i> (6) I=Generic <i>E. coli</i> (25) U= <i>E. coli</i> O157 Note: 1 sample could not be assessed
2018/2019 2019/2020	Ground lamb	<i>E. coli</i> O157 VTEC Generic <i>E. coli</i> <i>Salmonella</i>	387	321	64	1	I=non-O157 VTEC (62) I= Generic <i>E. coli</i> (2) U= <i>E. coli</i> O157 Note: 1 sample could not be assessed
2018/2019 2019/2020	RTE lunch meat	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	893	893	0	0	All satisfactory
2018/2019 2019/2020	RTE liver pâté	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	399	398	0	1	U= <i>L. monocytogenes</i>

Fiscal year(s)	Product	Microorganisms tested	Number of samples tested	Satisfactory (S)	Investigative (I)	Unsatisfactory (U)	Comments
2018/2019 2019/2020	RTE chicken or turkey breast strips	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	890	889	1	0	I=Generic <i>E. coli</i>
2019/2020	RTE sausage	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	593	591	1	1	I/U= <i>L. monocytogenes</i>
2018/2019 2019/2020	RTE fish and seafood	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	597	594	0	3	U= <i>L. monocytogenes</i>
2019/2020	RTE fish products	<i>L. monocytogenes</i> <i>Salmonella</i> <i>S. aureus</i> Generic <i>E. coli</i>	100	98	0	2	U= <i>L. monocytogenes</i>
2017/2018 2018/2019 2019/2020	Imported fresh berries	<i>Cyclospora</i> <i>Cryptosporidium</i> <i>Toxoplasma</i>	1146	1145	1	N/A	I= <i>Cyclospora</i>
2019/2020	Imported romaine lettuce	<i>E. coli</i> O157 Generic <i>E. coli</i>	287	287	0	0	All satisfactory
2019/2020	Imported romaine lettuce heart	<i>E. coli</i> O157 Generic <i>E. coli</i>	387	387	0	0	All satisfactory
2019/2020	Imported fresh-cut romaine lettuce	<i>E. coli</i> O157 Generic <i>E. coli</i>	293	293	0	0	All satisfactory
2018/2019 2019/2020	Domestic, conventional fresh baby leafy vegetables	<i>L. monocytogenes</i> <i>Salmonella</i> <i>E. coli</i> O157 Generic <i>E. coli</i>	327	324	3	0	I= <i>L. monocytogenes</i>
2018/2019 2019/2020	Domestic, organic fresh baby leafy vegetables	<i>L. monocytogenes</i> <i>Salmonella</i> <i>E. coli</i> O157 Generic <i>E. coli</i>	52	52	0	0	All satisfactory
2018/2019 2019/2020	Imported, conventional fresh baby leafy vegetables	<i>L. monocytogenes</i> <i>Salmonella</i> <i>E. coli</i> O157 Generic <i>E. coli</i>	1208	1198	10	0	I= <i>L. monocytogenes</i> (8) I=Generic <i>E. coli</i> (2)
2018/2019 2019/2020	Imported, organic fresh baby leafy vegetables	<i>L. monocytogenes</i> <i>Salmonella</i> <i>E. coli</i> O157 Generic <i>E. coli</i>	506	506	0	0	All satisfactory
2019/2020	Imported green onions	<i>Cyclospora</i> <i>Cryptosporidium</i> <i>Toxoplasma</i>	197	197	0	N/A	All satisfactory

Fiscal year(s)	Product	Microorganisms tested	Number of samples tested	Satisfactory (S)	Investigative (I)	Unsatisfactory (U)	Comments
2019/2020	Fresh seed sprouts	<i>E. coli</i> O157 VTEC Generic <i>E. coli</i>	288	287	0	1	U=Generic <i>E. coli</i>
2019/2020	Fresh microgreens	<i>E. coli</i> O157 VTEC Generic <i>E. coli</i> Salmonella <i>L. monocytogenes</i>	75	73	2	0	I= <i>L. monocytogenes</i> I=Generic <i>E. coli</i>
2018/2019 2019/2020	Fresh sprouts (bean, pea, seed) and microgreens	<i>L. monocytogenes</i> Salmonella <i>E. coli</i> O157 Generic <i>E. coli</i>	2345	2295	45	5	I= <i>L. monocytogenes</i> (36) I=Generic <i>E. coli</i> (9) U=Generic <i>E. coli</i>
2017/2018 2018/2019 2019/2020	Imported fresh leafy herbs	<i>Cyclospora</i> <i>Cryptosporidium</i> <i>Toxoplasma</i>	771	771	0	N/A	All satisfactory
2019/2020	Imported fresh leafy herbs (seasonal focus on cilantro)	<i>Cyclospora</i> <i>Cryptosporidium</i> <i>Toxoplasma</i>	402	402	0	N/A	All satisfactory
2017/2018	Imported fresh leafy herbs	HAV NoV (GI, GII)	799	798	1	N/A	I=NoV (GII)
2018/2019 2019/2020	Imported frozen cut fruits	HAV NoV (GI, GII)	484	484	0	N/A	All satisfactory
2019/2020	Dried grated coconut	<i>Salmonella</i> <i>B. cereus</i> <i>C. perfringens</i> <i>S. aureus</i> Generic <i>E. coli</i>	404	404	0	0	All satisfactory
2019/2020	Frozen raw coconut meat	<i>L. monocytogenes</i> Salmonella <i>E. coli</i> O157 Generic <i>E. coli</i> ACC	295	168	126	1	I=ACC (114) I=ACC & Generic <i>E. coli</i> (12) U=Salmonella
2019/2020	Plant-based cheese	<i>L. monocytogenes</i> Salmonella <i>S. aureus</i> Generic <i>E. coli</i>	171	170	1	0	I=Generic <i>E. coli</i>
2019/2020	Plant-based ice cream	<i>L. monocytogenes</i> Salmonella ACC Total coliforms	271	269	2	0	I= <i>L. monocytogenes</i> I=ACC
2019/2020	Plant-based milk	<i>L. monocytogenes</i> Salmonella ACC Total coliforms	467	463	4	0	I=ACC
2018/2019 2019/2020	Conventional ground spices	Salmonella <i>B. cereus</i> <i>C. perfringens</i>	755	754	0	1	U=Salmonella

Fiscal year(s)	Product	Microorganisms tested	Number of samples tested	Satisfactory (S)	Investigative (I)	Unsatisfactory (U)	Comments
		<i>S. aureus</i> Generic <i>E. coli</i>					
2018/2019 2019/2020	Organic ground spices	<i>Salmonella</i> <i>B. cereus</i> <i>C. perfringens</i> <i>S. aureus</i> Generic <i>E. coli</i>	338	337	1	0	I= <i>B. cereus</i>
Total (%)	-	-	21,626	21,230 (98.2)	374 (1.7)	20 (0.1)	Note: 2 samples could not be assessed

What do the survey results mean and what will they be used for

Interim results show that almost all (98.2%, 21,230/21,626) of the samples were assessed as satisfactory, while 1.7% (374/21,626) were assessed as investigative and 0.1% (20/21,626) were assessed as unsatisfactory. Most of the surveys covered in this report have a >95% satisfactory rate to date, with the only exceptions being:

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- milk from animals other than cows
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CFIA conducted appropriate follow-up activities for samples that were assessed as investigative or unsatisfactory. These follow-up activities may have included additional facility inspections, product recalls and additional sampling. There have been no reported illnesses linked to the contaminated products.

It is important to note that all results reported herein are considered preliminary, as the targeted surveys are still ongoing. Final reports, which will include a detailed analysis of the targeted survey results, will be shared over the next few years as the surveys are completed. Results from surveillance testing will be used by the CFIA to inform risk management decisions and to support program design and re-design.

References

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