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

Bacterial Pathogens, Viruses and Parasites in Various Food Commodities - April 1, 2016 to March 31, 2018

Food microbiology- Targeted surveys - Interim report

Canada

Summary

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 Canadian Food Inspection Agency (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 in the past. 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:

- flavoured refrigerated milk
- frozen dairy ice cream
- frozen pre-packaged cut fruits and berries
- raw ground beef
- raw ground veal
- stone fruits
- imported fresh leafy herbs
- imported ready-to-eat (RTE) fresh-cut fruits
- imported fresh berries
- snow and sugar snap peas

From April 1, 2016 to March 31, 2018, a total of 6632 samples of the above listed commodities were collected from retail locations in 11 cities across Canada and tested for various pathogens. Interim results show that almost all of the samples tested were free of the pathogens tested for, with 98.8% (6554/6632) of the samples being assessed as satisfactory. Of the 6632 samples tested, 1.1% (72/6632) were assessed as investigative and 0.1% (6/6632) were assessed as unsatisfactory. Most of the surveys covered in this report have a >99% satisfactory rate to date, with the only exceptions being: raw ground beef (98.8% satisfactory), raw ground veal (92.6% satisfactory), imported RTE fresh-cut fruits (97.1% satisfactory) and flavoured refrigerated milk (98.0% satisfactory).

The 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 the assessments reported herein are preliminary as the targeted surveys are still underway and consequently, no conclusions can be drawn at this time. It is unlikely, but possible that the assessments may be adjusted if any policy or regulatory change occurs with respect to a particular food/hazard combination. This report is being provided as a proactive means of sharing a snapshot of the work conducted to date. Final reports containing further details and a full analysis of the results will be made available in the coming 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. Originally started as a project under the Food Safety Action Plan (FSAP), 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.

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 did we test and why?

The commodities listed below were selected for targeted surveys to gather baseline information on the occurrence of pathogens (bacteria, viruses and parasites) in these foods. They are all commonly consumed by Canadians of all ages[1]. Unfortunately, most of these types of commodities have been associated with recalls and outbreaks of foodborne illnesses in the past, 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 in them creates a potential risk for foodborne illnesses.

- flavoured refrigerated milk
- frozen dairy ice cream
- frozen pre-packaged cut fruits and berries
- raw ground beef
- raw ground veal
- stone fruits
- imported fresh leafy herbs
- imported ready-to-eat (RTE) fresh-cut fruits
- imported fresh berries
- snow and sugar snap peas

What, when and from where did we sample?

All samples were collected from national retail chains and local/regional grocery stores located in 11 major cities across Canada. These cities encompassed four geographical areas: Atlantic (Halifax and Saint John), Quebec (Quebec City, Montreal), Ontario (Toronto, Ottawa), and the West (Vancouver, Kelowna, Calgary, Saskatoon and Winnipeg).

A sample consisted of a single or multiple unit(s) (individual consumer-size package(s)) from a single lot with a sufficient total weight to conduct all analyses (approximately 250g).

Samples were collected between April 1 and March 31 of the year(s) in which the targeted surveys were conducted**.**

How many samples have been collected and what have they been tested for?

The number of samples collected for each targeted survey and the microorganisms (bacteria, viruses and parasites) for which they were tested are outlined in Table 1.

Table 1 - Targeted survey details

Anticipated targeted survey period - fiscal year(s)	Commodity	Total number of samples collected and tested to March 31, 2018	Microorganisms tested
2017 to 2020	Flavoured refrigerated milk	502	*Listeria monocytogenes (L. monocytogenes)*, aerobic colony count (ACC)
2017 to 2020	Frozen dairy ice cream	506	*L. monocytogenes*, ACC
2017 to 2020	Frozen pre-packaged cut fruits and berries	795	*L. monocytogenes,* generic *Escherichia coli* (*E. coli*)
2016 to 2017	Raw ground beef	589	*E. coli* O157, non-O157 Verotoxigenic *E. coli* (non-O157 VTEC)
2017 to 2019	Raw ground veal	568	*E. coli* O157, non-O157 VTEC, generic *E. coli*
2016 to 2017 and 2018 to 2020	Stone fruits	1001	Generic *E. coli*, *E. coli* O157, *Salmonella* species (spp.), *L. monocytogenes, Shigella*
2017 to 2020	Imported fresh leafy herbs	401	*Cyclospora, Cryptosporidium, Toxoplasma*
2017 to 2018	Imported fresh leafy herbs	799	Hepatitis A virus (HAV), Norovirus (NoV) (Genotype I and II (GI, GII))
2017 to 2020	RTE fresh-cut fruits	380	HAV, NoV (GI, GII)
2017 to 2020	Imported fresh berries	400	*Cyclospora, Cryptosporidium, Toxoplasma*
2016 to 2019	Snow and sugar snap peas	691	*Cyclospora, Cryptosporidium, Toxoplasma, Giardia*

What analytical methods were used and how were 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 2) are based on the principles of Health Canada's *Health Products and Food Branch Standards and Guidelines for Microbiological Safety of Foods*[3] or in the absence of Health Canada's Guidelines, on other international food safety authorities' microbiological guidelines[4-6]. The assessment guidelines for *L. monocytogenes* are based on Health Canada's Policy on *Listeria monocytogenes* in RTE foods[7] and are dependent upon the sample type analysed (Category 1, 2A or 2B). The assessment guidelines for *E.coli* O157 in raw ground beef and veal are based on Health Canada's Guidance Document on *E. Coli O157:H7 and E. Coli O157:Nm in Raw Ground Beef*[8].

No assessment guidelines had been established in Canada for the presence of ACC, generic *E. coli, Salmonella* spp., *Shigella, E.coli* O157, or non-O157 VTEC in some food commodities at the time of writing this report. As *Salmonella* spp., *Shigella* and *E. coli* O157 are considered pathogenic to humans their presence was considered to be a violation of the *Food and Drugs Act* (FDA) Section 4(1)a[9] and therefore in the absence of assessment guidelines, was assessed by the CFIA as unsatisfactory. The detection of non-O157 VTEC was assessed as investigative, indicating that further follow-up actions may be warranted depending upon the serotype identified. All non-O157 VTEC have the potential to cause human illness, however at this time there is no established virulence profile for pathogenic non-O157 VTEC[8] and consequently unless previously associated with human illness it is difficult to establish its human health significance. Of the non-O157 VTEC serotypes identified to date, the following have been identified as causing the majority of non-O157 VTEC infections in Canada (O26, O103, O111, O117, O121, and O145)[10].

Unlike harmful bacterial pathogens (e.g. *Salmonella, E. coli* O157), generic *E.coli*, are commonly found in the intestines of humans and most strains are harmless. Similarly, ACC is the total number of generally harmless bacteria that are able to grow in an oxygenated (aerobic) environment. ACC are normal components of the environment and can be found in soil and natural water sources. Both generic *E. coli* and ACC are considered to be indicator organisms and their levels present in a food product are used to assess the overall sanitation conditions throughout the food chain from production to the point of sale. Their presence at some levels is tolerated. An investigative assessment which may result in further follow-up actions is associated with elevated levels (See Table 2). As the results are based on the analysis of one unit (n=1), further sampling may be required to verify their levels in the lot. An unsatisfactory

assessment is associated with the presence of high levels of these organisms (See Table 2) as it may indicate a breakdown in Good Agricultural Practices, or Good Manufacturing Practices (sanitation practices), and therefore possibly warranting the initiation of follow-up activities to, for example, improve sanitation conditions along the food chain.

Table 2 - Assessment criteria for bacteriology tests

Analysis	Commodity	Satisfactory assessment	Investigative assessment	Unsatisfactory assessment
ACC	Refrigerated flavoured milk	≤5x10^4 CFU/g	>5x10^4 and ≤10^6 CFU/g	>10^6 CFU/g
ACC	Frozen dairy ice cream	≤10^5 CFU/g	>10^5 and ≤10^6 CFU/g	>10^6 CFU/g
Generic *E.coli*	Frozen pre-packaged cut fruits and berries	≤ 10^2 CFU/g or MPN/g	>10^2 and ≤10^3CFU/g or MPN/g	>10^3 CFU/g or MPN/g
Generic *E.coli*	Raw ground veal	≤ 10^2 CFU/g or MPN/g	>10^2 CFU/g or MPN/g	N/A
Generic *E.coli*	Stone fruits	≤10^2 CFU/g or MPN/g	>10^2 and ≤10^3 CFU/g or MPN/g	>10^3 CFU/g or MPN/g
***Salmonella* spp.**	Stone fruits	Not detected/25g	NA	Detected/25g
***Shigella* spp.**	Stone fruits	Not detected/25g	NA	Detected/25g
***E. coli* O157**	Raw ground beef and veal, stone fruits	Not detected/25g or 65 g (raw ground meat)	NA	Detected/25g or 65 g (raw ground meat)
Non-O157 VTEC	Raw ground beef and veal	Not detected /65g	Detected /65g	NA
L. monocytogenes	Stone fruits	Not detected/25g	Detected/25g	NA
L. monocytogenes	Refrigerated flavoured milk (category 1 product)	Not detected/25g	NA	Detected/25g
L. monocytogenes	Frozen dairy ice cream, Frozen pre-packaged cut fruits and berries (category 2A and B product)	Not detected/25g	Detected/25g and ≤10^2 CFU/g	>10^2 CFU/g

At the time of writing this report, no assessment guidelines had been established in Canada for viruses and parasites in whole or fresh-cut produce. In addition, the analytical methods used to analyse the samples detect the presence of viral RNA and parasite DNA and cannot discriminate between viable (potentially infectious) from non-viable (non-infectious) viruses and parasites. Consequently, the detection of viral RNA or parasite DNA was assessed as investigative indicating that further consideration is warranted to determine which follow-up activities would be the most appropriate (Table 3).

Table 3 – Assessment criteria for parasitology and virology tests

Analysis	Satisfactory assessment	Investigative assessment	Unsatisfactory assessment
Cryptosporidium	Not detected	Detected	NA
Cyclospora	Not detected	Detected	NA
Giardia	Not detected	Detected	NA
HAV	Not detected	Detected	NA
NoV (GI and GII)	Not detected	Detected	NA

What were the survey results?

Results of the targeted surveys (as of March 31, 2018) can be found in Table 4.

Table 4 - Survey results as of March 31, 2018

Commodity	Total number of samples tested to March 31, 2018	Satisfactory (S)	Investigative (I)	Unsatisfactory (U)	Results
Flavoured refrigerated milk	502	492 (98.0%)	6 (1.2%)	4 (0.8%)	I= >5x10^4-10^6 CFU/g ACC(6) U= >10^6 CFU/g ACC(4)
Frozen dairy ice cream	506	503 (99.4%)	2 (0.4%)	1 (0.2%)	I= 10^5 - 10^6 CFU/g ACC(2) U= >10^6 CFU/g ACC(1)
Frozen pre-packaged cut fruits and berries	795	795 (100%)	N/A	N/A	All satisfactory
Raw ground beef	589	582 (98.8%)	7 (1.2%)	N/A	I=non-O157 VTEC (7)
Raw ground veal	568	526 (92.6%)	41 (7.2%)	1 (0.2%)	I=non-O157 VTEC (30), I=non-O157 VTEC + >100 CFU/g generic E.coli (5), I=>100 CFU/g generic E.coli (6), U=*E. coli* O157(1)
Stone fruits	1001	998 (99.7%)	3 (0.3%)	NA	I=*L. monocytogenes* (3)
Imported fresh leafy herbs	401	401 (100%)	N/A	N/A	All satisfactory
Imported fresh leafy herbs	799	798 (99.9%)	1 (0.1%)	N/A	I= NoV (GII)(1)
RTE fresh-cut fruits	380	369 (97.1%)	11 (2.9%)	N/A	I=HAV (5) I=NoV (GI) (4) I=NoV (GII) (2)
Imported fresh berries	400	399 (99.8%)	1 (0.2%)	N/A	I=Cyclospora(1)
Snow and sugar snap peas	691	691 (100%)	-	NA	All satisfactory
Grand total	**6632**	**6554 (98.8%)**	**72 (1.1%)**	**6 (0.1%)**	

What do the survey results mean and what are they used for?

Interim results show that almost all of the samples tested were free of the pathogens tested for, with 98.8% (6554/6632) of the samples being assessed as satisfactory. Of the 6632 samples tested, 1.1% (72/6632) were assessed as investigative and 0.1% (6/6632) were assessed as unsatisfactory. Most of the surveys covered in this report have a >99% satisfactory rate to date with the following exceptions: raw ground beef (98.8% satisfactory), raw ground veal (92.6% satisfactory), RTE fresh-cut fruits (97.1% satisfactory) and flavoured refrigerated milk (98.0% satisfactory).

The 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.

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Surveillance testing results will be used by the CFIA to inform risk management decisions and to support program design and re-design.

References

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