



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Bacterial Pathogens and Indicators in Pasteurized Cheese - April 1, 2018 to March 31, 2021

Food microbiology - Targeted surveys - Final report



Summary

A 3-year targeted survey¹ analysed 5206 samples of a variety of pasteurized cheese products (soft cheese with spices, single serve cheese, pre-sliced cheese, shredded cheese, firm and hard cheese) for the presence of the pathogens *Listeria monocytogenes* (*L. monocytogenes*), *Salmonella* species (spp.), and *Staphylococcus aureus* (*S. aureus*). All samples were also tested for generic *Escherichia coli* (*E. coli*) which is an indicator of the hygienic and sanitary conditions of the food supply chain from production to the point of sale.

Over 99.9% of the samples tested were found to be satisfactory. *Salmonella* spp., was not detected in any of the samples. *L. monocytogenes* was detected in 1 sample. *S. aureus* and generic *E. coli*, both at elevated levels were found in 1 sample each respectively. The Canadian Food Inspection Agency (CFIA) conducted appropriate follow-up activities. There were no reported illnesses related to these products.

Overall, our survey results indicate that pasteurized cheese sold in Canada are generally safe for consumption, however they can occasionally be contaminated. Consequently, as with all food, and especially those that are ready for consumption without further preparation or cooking, good hygienic practices are recommended for producers, retailers and consumers.

Why was this survey conducted

The survey was conducted to generate baseline information on the quality and safety of pasteurized cheese sold at retail in Canada. The product types sampled under this survey included soft² cheeses with spices, single serve cheeses, pre-sliced cheeses, shredded cheeses, firm,² and hard² cheeses which are all commonly consumed by Canadians of all ages³. Unfortunately, many of these foods have been associated with recalls⁴, and foodborne illness outbreaks^{5, 6, 7} and are considered to be high-risk foods⁸.

Contamination with bacterial pathogens can occur at any step in the food supply chain such as during production, processing, packaging, distribution and/or at retail and when consumed, their presence creates the potential for foodborne illness. In an attempt to determine the cumulative effect of each step in the food supply chain on the overall quality and safety of the food, and unique to specific surveys, samples were collected as close to the product best before date as possible.

When was the survey conducted

The survey was conducted over a 3-year period from April 1, 2018 to March 31, 2021, however firm² and hard² cheeses were only collected during the last 2 years of the survey.

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
- Saint John or Moncton
- Quebec City
- Montreal
- Toronto
- Ottawa
- Vancouver
- Kelowna or Victoria
- 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 5206 pasteurized cheese samples were collected. A variety of product types were selected to represent a range of moisture content (soft², firm² and hard² cheeses) and a varying degree of processing (blocks, sliced, shredded, grated). Of the 5206 samples collected, 1264 were soft² cheeses with spices, 1191 were shredded or grated cheeses, 1185 were pre-sliced cheese, 888 were single serve cheeses, and 678 were firm² or hard² cheeses. A sample consisted of a single or multiple consumer sized packages of the same lot weighing at least 250g. Samples were collected as close to the best before date as possible to account for the effects of storage conditions along the food chain.

What were the samples tested for

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

What methods were used to tests the samples

Samples were analyzed using analytical methods published in Health Canada's *Compendium of Analytical Methods for the Microbiological Analysis of Foods*⁹ that were suitable for the testing of pasteurized cheese.

How were samples assessed

The samples were assessed using criteria based on the principles of following Health Canada documents: *Health Products and Food Branch Standards and Guidelines for Microbiological Safety of Foods – An Interpretive Summary*¹⁰, *Policy on Listeria monocytogenes in Ready-to-Eat Foods* and the *Food and Drugs Act*¹¹ (Section 4(1)).

Table 1 - Assessment criteria

Bacteria	Satisfactory	Investigative	Unsatisfactory
<i>L. monocytogenes</i>	Not detected	Not applicable (category 1 ^a) Detected and $\leq 10^2$ CFU/g (category 2 ^a)	Detected (category 1 ^a) > 10^2 CFU/g (category 2 ^a)
<i>Salmonella</i> spp.	Not detected	Not applicable	Detected
<i>S. aureus</i>	$\leq 10^2$ CFU/g	> 10^2 and $\leq 10^4$ CFU/g	> 10^4 CFU/g
Generic <i>E. coli</i>	$\leq 10^2$ CFU/g	> 10^2 and $\leq 2 \times 10^3$ CFU/g	> 2×10^3 CFU/g

^a The pH and water activity of the sample were used to determine the product category

No assessment guidelines had been established in Canada for the presence of *Salmonella* spp. in pasteurized cheese at the time of writing this report. As this bacteria is considered pathogenic to humans it's presence was assessed as unsatisfactory as it is considered to be a violation of the *Food and Drugs Act*¹¹ Section 4(1)a.

What were the survey results

Over 99.9% of the samples tested were found to be satisfactory. *Salmonella* spp. was not found in any of the samples tested. *L. monocytogenes* was detected in 1 sample and at a level of <5 CFU/g. *S. aureus* at 380 CFU/g and generic *E. coli* at 300 CFU/g were found in 1 sample each respectively.

Table 2 - Assessment results

Bacteria	Number of samples tested	Satisfactory (%)	Investigative (%)	Unsatisfactory (%)
<i>L. monocytogenes</i>	5206	5203	0	1 ^b
<i>Salmonella</i> spp.			Not applicable	0
<i>S. aureus</i>			1 ^c	0
Generic <i>E. coli</i>			1 ^d	0
Total	5206	5203 (99.9)	2 (0.04)	1 (0.02)

^b < 5 CFU/g, Cream cheese balls with cheddar, bacon, nuts, herbs etc. (category 1)

^c 380 CFU/g, Halloumi cheese

^d 300 CFU/g, Raclette pre-sliced cheese

Survey results are also presented by origin (table 3) and product type (table 4).

Table 3 - Assessment results by product origin

Product origin	Number of samples tested (%)	Satisfactory	Investigative	Unsatisfactory
Domestic	3024 (58.1)	3025	1	0
Import	1150 (22.1)	1147	1	0
Unknown ^e	616 (11.8)	615	0	1
Unknown ^e (domestically processed) ^f	416 (8.0)	416	0	0
Total	5206	5203	2	1

^e "Unknown" refers to those samples for which the country of origin could not be assigned from the product label or available sample information.

^f "Domestically processed" refers to products which could be assigned as being processed in Canada based on the product label or available sample information.

Table 4 - Assessment results by product type

Product type	Number of samples tested (%)	Satisfactory	Investigative	Unsatisfactory
Soft cheese ² with spices or other flavour ingredients	1264 (24.3)	1263	0	1 ^g
Shredded or grated cheese	1191 (22.9)	1191	0	0
Pre-sliced cheese	1185 (22.8)	1184	1 ^h	0
Single serve cheese (blocks, strings, balls)	888 (17.1)	888	0	0
Firm ² or hard ² cheese	678 (13.0)	677	1 ⁱ	0
Total	5206	5203	2	1

^g *L. monocytogenes* detected in cream cheese balls with cheddar, bacon, nuts, herbs etc. (category 1)

^h Generic *E. coli* detected in Raclette pre-sliced cheese

ⁱ *S. aureus* detected in Halloumi cheese

What do the survey results mean

Previous Canadian¹² and international¹³ studies on the microbiological quality and safety of retail pasteurized cheeses have shown results approximating those in our 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 pasteurized cheese sold in Canada are generally safe for consumption, however they can be infrequently contaminated. Consequently, as with all foods, and especially with those that are ready for consumption without further preparation or cooking, 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 illness were related to the investigative and unsatisfactory samples, these results triggered appropriate follow-up actions including:

- facility inspections
- additional sampling and testing
- removal of affected products from the marketplace

Can I access the survey data

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

References

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