



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Bacterial Pathogens in Cold Brewed Coffee - April 1, 2018 to March 31, 2019

Food microbiology - Targeted surveys - Final report



Summary

Cold brewed coffees have seen a recent increase in popularity in North America. Even with the rise in recent popularity, there is currently an absence of food safety data. Cold brewed coffee is considered to be higher risk^[1] compared to traditionally brewed coffee as it is not subject to a heat treatment step and may be stored in the refrigerator for extended periods of time and therefore providing the opportunity for potential contaminants to survive or grow.

Considering the factors mentioned above and their relevance to Canadians, the Canadian Food Inspection Agency (CFIA) as part of its food microbiology surveillance program decided to conduct a one year study to investigate the microbiological quality and safety of cold brewed coffee.

Over the course of this study (April 1, 2018 to March 31, 2019), a total of 59 samples of cold brewed coffee were collected from retail establishments in 11 cities across Canada. These samples were tested for the bacterial pathogens; *Salmonella* species (spp.) and *Escherichia coli* (*E. coli*) O157. The samples were also tested for Aerobic Colony Count (ACC) and generic *E. coli* which are indicators of the overall sanitation conditions throughout the food production chain from production to the point of sale.

In this study, 15 out of 59 (25.4%) samples were assessed as investigative for ACC. *Salmonella* spp., *E. coli* O157 and generic *E. coli* (>100 Most Probable Number (MPN)/mL) were not found in any of the samples. There are numerous points in the production chain where contamination can occur, such as during the harvest and processing of the coffee beans and preparation (use of contaminated water for brewing, use of unsanitary equipment and containers). Contamination can also be introduced by infected personnel, or an unsanitary production environment. Given that cold brewed coffee is usually consumed “as is”, the presence of pathogens could create a potential risk for foodborne illnesses.

Overall, our survey results indicate that most cold brewed coffees are safe for consumption as most of the samples appear to have been produced under sanitary conditions. However, a loss of sanitation controls along the food production chain can occur. As the number of samples, product types and microorganisms tested in our study were limited; our results should be interpreted within that context. CFIA will continue to monitor the food supply to ensure all foods, including cold brewed coffee meets Canadian food safety standards. Additionally, as with all foods, safe food handling practices are recommended for producers, retailers and consumers.

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.

Why did we conduct this survey

Cold brew coffee is a popular beverage that has recently invigorated the coffee industry. Cold brewed coffee is generally made by soaking coarse ground coffee in water at ambient temperatures for 12-24 hours, straining, bottling/canning and then storing in the refrigerator until consumed. It is time, rather than heat that extracts the flavour, caffeine, and sugars from the coffee beans. Cold brew coffee may support the survival and growth of pathogens that would otherwise be inactivated by hot water during the preparation of traditionally brewed coffee. Due to the lack of hot water used for brewing and the extended hours of soaking the coffee, there could be a food safety concern. Therefore, the CFIA decided to conduct a small survey of 59 samples.

What did we sample

For this study, refrigerated, pre-packaged cold brewed coffee of different brands and types were sampled evenly throughout the fiscal year (April 1, 2018 to March 31, 2019). No restrictions were placed on country of origin, brand, product type, packaging etc.

A sample consisted of a single or multiple unit(s) (individual consumer-size container(s) from a single lot) with a total volume of at least 250 mL. All samples were collected from national and local/regional retail stores located in 11 major cities across Canada. These cities encompassed 4 geographical areas:

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

The number of samples collected from these cities was in proportion to the relative population of the respective areas.

What analytical methods were used and how were samples assessed

Samples were analyzed using analytical methods published in Health Canada’s *Compendium of Analytical Methods for the Microbiological Analysis of Foods*^[2] (table 1).

Table 1 – Analytical methods and assessment criteria for bacteria in cold brewed coffee

Bacterial analysis	Method identification number ^a	Satisfactory assessment	Investigative assessment	Unsatisfactory assessment
ACC	MFHPB-18	≤10 ² colony forming units (CFU)/mL	> 10 ² CFU/mL	Not applicable (N/A)
Generic <i>E. coli</i>	MFHPB-19	≤10 ² MPN/mL	>10 ² MPN/mL	N/A
<i>Salmonella</i> spp.	MFLP-49	Absent in 25g	N/A	Present in 25g
<i>E. coli</i> O157	MFHPB-10 MFLP-30	Absent in 25g	N/A	Present in 25g

^a The methods used were the published versions at the time of analysis

At the time of writing this report, no assessment guidelines had been established in Canada for the presence of indicator organisms or pathogenic bacteria in cold brewed coffee. As *Salmonella* spp. 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^[3] and therefore in the absence of assessment guidelines were assessed by the CFIA as unsatisfactory (table 1).

Unlike harmful bacterial pathogens (*Salmonella*, *E. coli* O157), generic *E. coli* is commonly found in the intestines of animals and 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 is associated with elevated levels of generic *E. coli* and

ACC (>100 CFU or MPN/mL) (table 1), which may result in further follow-up actions. 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.

What were the survey results

Over the course of this study (April 1, 2018 to March 31, 2019), a total of 59 samples were collected and tested for bacterial pathogens (*Salmonella* spp., *E.coli* O157) as well as generic *E. coli* and ACC. Generic *E. coli* and ACC are indicators of the overall sanitation conditions throughout the food production chain. Sample assessment results can be found in table 2.

Table 2 – Assessment results of cold brewed coffee

Bacterial analysis	Number of samples tested	Satisfactory (% total)	Investigative (% total)	Unsatisfactory (% total)
ACC	59	44 (74.6)	15 (25.4)	N/A
Generic <i>E. coli</i>			0	N/A
<i>Salmonella</i> spp.			N/A	0
<i>E. coli</i> O157			N/A	0
Total	59	44 (74.6)	15 (25.4)	0 (0)

Salmonella spp., *E. coli* O157 and generic *E. coli* (>100 MPN/mL) were not found in any samples. 15 samples (25.4%) were found to have elevated (> 100 CFU/g) levels of ACC.

Of the 59 samples tested, 27 (45.8%) were domestic, 12 (20.3%) were imported and 20 (33.9%) were of unknown origin (table 3). The products were either cold brewed coffee 43 (72.9%) or cold brewed coffee with nutmilk 16 (27.1%) (table 3).

Table 3 – Sample distribution by product type and origin

Product type	Country of origin	Satisfactory	Investigative (ACC > 100 CFU/g)	Total number of samples tested
Cold brewed coffee	Domestic and import	28	15	43
Cold brewed coffee	Canada	10	11	21
Cold brewed coffee	United States	2	1	3
Cold brewed coffee	Brazil and Ethiopia	0	1	1
Cold brewed coffee	Unknown	16	2	18
Cold brewed coffee with nutmilk	Domestic and import	16	0	16
Cold brewed coffee with nutmilk	Canada	6	0	6
Cold brewed coffee with nutmilk	United States	8	0	8
Cold brewed coffee with nutmilk	Unknown	2	0	2
Total	Domestic and import	44	15	59

What do the survey results mean

In this preliminary survey, *Salmonella* spp., *E. coli* O157, and generic *E. coli* (>100 MPN/mL) were not found in any of the 59 samples analysed. Elevated levels of ACC (>100 CFU/g) were found in 15 of the 59 (25.4%) samples. In response, CFIA conducted appropriate follow-up activities.

In 2017 a small challenge study^[4] was conducted in the United States to investigate the survival of non-spore forming foodborne pathogens in cold brewed coffee. Several sealed 11oz bottles of fresh (7 days old) cold brewed coffee were inoculated with 3 strains each of *E. coli* O157:H7, *Salmonella* spp. and *Listeria monocytogenes* at populations of $\sim 1 \times 10^5$ CFU/mL and held at refrigerator and at room temperatures for up to 3 weeks. The cold brewed coffee was inoculated with pathogens at levels much greater than would normally be found in a food processing facility. No growth or survival of any of the pathogens was observed during this period. The study concluded that cold brewed coffee does not favour the survival or growth of vegetative bacterial pathogens most likely due to the lack of microbial nutrients and/or the presence of antimicrobial factors present within the coffee. These findings support our survey results as we did not detect the presence of any pathogens (*Salmonella* spp. or *E. coli* O157) in the 59 samples of cold brewed coffee we tested. Given that our survey found elevated (> 100 CFU/g) levels of ACC in 25.4% (15/59) of the samples, it appears that cold brewed coffee may be able to support the survival of some bacteria and may indicate a breakdown of good hygiene practices within the production process. Consequently, further studies may be warranted to determine the source of the contamination and if there are critical control points in the production chain that should be identified and addressed by industry.

In the United States in 2017, there was a company initiated product recall of nitro cold brewed coffee due to the potential for the growth and production of the toxin botulin^[5] within the cans of cold brewed coffee. Production was halted until an additional step in the manufacturing process was implemented. No illnesses were reported.

Overall, our survey results indicate that most cold brewed coffees are safe for consumption as most samples appear to have been produced under sanitary conditions. However, contamination by bacterial pathogens can occur occasionally, and a loss of sanitation controls along the food production chain can occur as well. Consequently, as with all foods, safe handling practices are recommended for producers, retailers and consumers.

As the number of samples, product types and microorganisms tested in our study were limited; our results should be interpreted within that context. CFIA will continue to monitor the food supply to ensure all foods, including cold brewed coffee, meets Canadian food safety standards.

References

1. British Columbia Centre for Disease Control, *Risk assessment of nitro cold brew coffee products*. Environmental Health Services, 2017.
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