An Investigation of Container Type on Temperature of Milk in Toronto Coffee Shops

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AIM

This research represents an attempt to evaluate the effectiveness of the type of container used for the cold-holding of milk at a temperature of 4°C or lower at coffee shops in Toronto

ABSTRACT

Self-serve pasteurized milk kept at room temperatures in coffee shops is a public health issue that often goes unnoticed by both consumers and food premises. Despite the fact that pasteurized milk poses a very low risk to the general public, it still has the potential to support bacterial growth if it is stored in the temperature danger-zone between 4°C to 60°C. A low risk food does not mean it is poses no risk. According to the Ministry of Health and Long-term Care, the cold-holding zone for all foods including milk is at or below 4°C (Ministry of Health and Long-term Care – Public Health Division, 2017). It can be a challenge for food premise owners that sell hot beverages to maintain the temperature of their self-serve milk throughout the day. A field/observational study was conducted in coffee shops of central Toronto to investigate the relationship between the temperature of milk and the type of container used for the cold-holding of milk. The data used in this study was obtained by recording the temperature of self-serve milk at 52 randomly selected coffee shops. Milk temperatures were recorded on four randomly selected days in the months of October and November 2017 from 9 am to 4 pm. In addition, coffee shop operators were asked a recall question about how long the container of milk had been sitting on the counter.

OBJECTIVES

The goal of this research was to determine a consistent and effective method for the cold-holding of milk for food premises that provide self-serve milk to consumers. The first objective of this research project was to examine the relationship between the type of container used for self-serve milk, temperature, and amount of time the milk was placed in room temperature. The second objective was to analyze how effective the various containers used by coffee shops were in maintaining the temperature of milk at 4°C or lower.

METHODS

Participants

The data collection for this study was conducted in collaboration with Toronto Public Health. A total of 52 coffee shops were randomly selected in the downtown Toronto area.

Materials

The materials that were used for this study consisted of:

- Digital thermometer with a metal probe to test the internal temperature of milk from inside the cold-holding containers
- Alcohol swabs that were used to disinfect metal probe upon each visit before the each temperature reading
- Cup of ice used for thermometer calibration prior to collecting data on each day assigned for visits

Figure 1. *Digital probe thermometer used for recording milk temperatures*

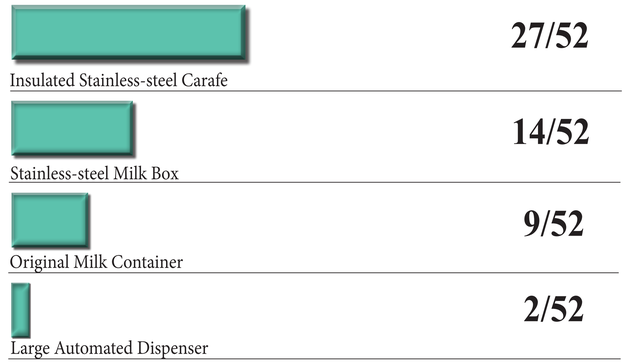
Protocol/Experimental Design

- Prior to conducting each temperature reading, the thermometer was calibrated and the metal probe was disinfected using an alcohol swab
- The probe was then immersed into the milk half way inside the container for at least 15 seconds to gain an accurate temperature reading
- The temperature along with the date, time, name of location, and type of container was recorded. In addition, an operator was asked a recall question about how long the milk had been sitting out on the counter.
- The total duration of each visit did not exceed 10 minutes after which the next visit took place following the same procedure.

Figure 2. *Image 1 (Stainless-steel Insulated Carafe), 2 (Stainless-steel thermos bottle), 3 (Original milk container), and 4 (Stainless-steel milk box) display a few containers observed at coffee shops.*

RESULTS

This study found a strong correlation between the duration of time the milk was on the counter and type of container which both impacted the temperature of milk. For milk that was left out for an hour or less in an insulated stainless-steel container, the temperature was found to be at 4°C or lower.



Temperature

- Highest Temperature Recorded: **20° C in a stainless-steel milk box**
- Lowest Temperature Recorded: **3° C in a stainless-steel insulated carafe**

Although 16 out of the 52 coffee shops that were visited were not in compliance by keeping the temperature of milk at 4°C or lower even with the use of insulated stainless steel carafes; milk that was stored in insulated stainless steel carafes was found to be more effective in the cold-holding of milk compared to the other three types of containers. In addition, milk that was stored outside of the fridge in its original carton was found to be the least effective in the cold-holding of milk.

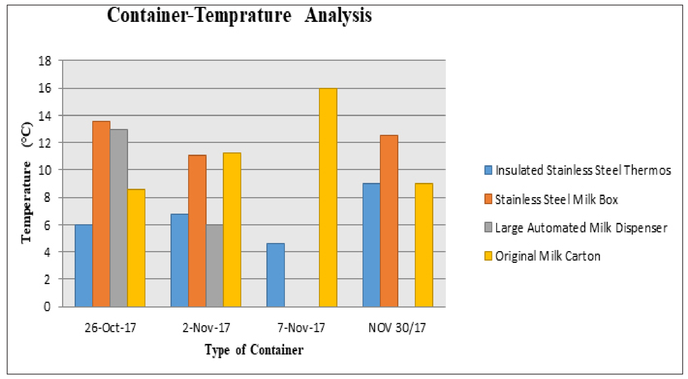


Figure 3. *Average of recorded temperature from each container compared to the four different types of containers observed on four separate days.*

Time of milk container on Counter

Recall question: How long has the milk been placed in room temperature?

Based on the recall question about how long the milk had been outside on the counter, 45 out of 52 coffee shop operators stated that milk was on the counter for 2 hours or less and the remaining 12 locations stated that it had been left out from two to 6 and half hours.

DISCUSSION

- 37 out of 52 coffee shops visited were not in compliance with the Regulation made by the *Health Promotion and Protection Act*, section 46 (1) which states that: *Milk products shall be cooled immediately after pasteurization to a temperature of at least 5° Celsius or less.*
- Results showed that the stainless-steel insulated carafe was the most effective in the cold-holding of milk compared to the stainless-steel carton holder which displayed poorer insulation qualities.
- In 2001, based on the exception made to the Food Premise Regulation 562, section 30, the use of a vacuum thermos was permitted for adding milk and cream to beverages or cereals if the milk and cream was not to exceed 2.8°C above the required 5 °C over a period of 6 hours at a room temperature of 20°C (MOHLTC, 2001). However, based on the results from the present study; milk stored in an insulated stainless-steel carafe had an average temperature of 9°C when it was placed in room temperature for an average of 3.5 hours. This is a 4°C increase in temperature of milk just in an additional 2.5 hours.
- Pathogenic bacteria of concern include (Tewari & Abdullah, 2014; Food Standards Australia New Zealand, 2013; Walker, 2014):
  - *Staphylococcus aureus* – Bacterial growth can begin at 7°C; Enterotoxin production can begin at 10°C
  - *Bacillus cereus* – Bacterial growth can begin at 5°C; Emetic toxin production can be -gin at 12°C; Diarrheal Toxin production can begin at 10 °C.
  - *Listeria monocytogenes* – Bacteria can survive and grow at temperatures as low as -1.5 to 7°C.
  - *Pseudomonas* – Bacteria can grow and survive at temperatures of 4°C and over

RECOMMENDATIONS

Based on this study, section 30 of the Health Protection and Promotion Act under Ontario Regulation 562 should be updated to provide clear and consistent requirements for the cold-holding of counter-top milk. This update will also assist public health inspectors in being able to recommend an effective method for the cold-holding of milk that is in compliance with the Regulation. Furthermore, the public health authorities should re-evaluate the exception made under section 30 of the Food Premise Regulation 562 and make changes in which all food premises that provide self-serve milk to the public be required to keep the temperature strictly at 5°C or lower by storing milk in vacuum insulated containers for a maximum of one hour, and not six to reduce the risk of bacterial growth in milk attributed to temperature abuse. The use of Ultra-High Temperature milk; also known as milkettes is encouraged as an alternative to vacuum insulated containers as they have a longer shelf-life and do not require refrigeration.

CONCLUSION

Even though pasteurized milk is considered a low risk food, there have been several outbreaks that have been associated with it. Milk that is stored at temperatures over 4°C becomes an ideal medium for the growth of pathogenic and spoilage bacteria which can potentially cause illness especially in high risk groups such as pregnant women, children under the age of five, and adults over the age of 60 (Thomas et al., 2015). The present study is unique because it addresses an issue that is of concern to public health agencies, and often overlooked by food premise operators, and consumers. The results from this study indicate the need for a consistent and effective method for the cold-holding of self-serve milk at all food premises in Toronto.

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