

Ice safety assessment in Toronto food premises related to handling protocols and microbiological analysis

Amir Kavehei, Dr. Richard Meldrum, and Dr. Fatih Sekercioglu

School of Occupational and Public Health, Ryerson University

Abstract

Numerous pathogens can survive and grow in ice, making this high demand food product a potential health hazard to the public. It has been documented that several food establishments in Toronto committed crucial infractions related to served ice. In this study, ice samples were collected from 25 food premises in Toronto to assess microbiological quality. A visual inspection was also conducted to evaluate safe food handling practices related to ice. In 4% of the collected samples, there were >80 cfu/100 mL of total coliforms and 20 cfu/100 mL of E.coli. 76% of selected food premises had at least one issue pertaining to the sanitary practices of handling served ice. 40% of food premises lacked a well-informed operator, knowledgeable about cleaning the ice machine. 48% of the inspected ice machines had biofilms. One operator handled the ice without a scoop. The scoop was dirty in 36% of the premises and was stored inappropriately in 24% of the premises. 12% of premises had a history of conditional pass or fail over the past two years. 12% of premises kept their ice machine in a room with poor light and ventilation. 32% of the selected establishments used a dirty container for transporting the ice while, 12% had ice machines that were not maintained in good condition. These results indicated that the served ice in Toronto can present a health hazard to the public and there should be an improvement in regard to the safe handling of served ice.

Introduction

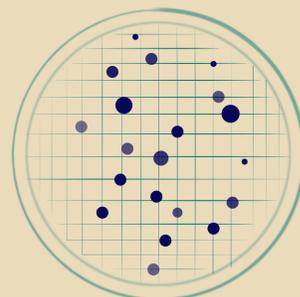
In relation to food safety, ice has been described as forgotten food since its inherent frozen nature can mislead the public of its safety for consumption.¹ However, it has been proven that numerous pathogens such as Escherichia Coli, Salmonella, Yersinia spp, Vibrio Cholera, Norovirus, and Hepatitis A can be associated with contaminated ice.² Some pathogenic fungi such as Candida parapsilosis and Cryptococcus curvatus maintained their survival rate in the ice mixed with soft and alcoholic drinks.³ In addition to ubiquitous fungi, ice and ice machines can harvest pathogenic slimes known as biofilms.⁴ In Ontario, there are acts, regulations, and guidelines related to ice. Ice is under the definition of food in the Health Protection and Promotion Act.⁵ Regulation 493/17 mandates that ice used for preparing food and drinks should be appropriately handled and kept in safe storage.⁶ The Ministry of Health and Long Term Care directs food handlers to carry ice with a scoop instead of hands. The scoop should be made out of metal or plastic and not glass since a possible broken piece can intensify the risk of physical hazard. Furthermore, food items that are not intended for drinking should not be stored in ice machines.⁷ In 2019, Toronto Dine Safe revealed that between October 2017 to October 2019, several food premises in Toronto committed infractions related to ice including: storing the ice in an unhygienic manner, making ice from water that was not potable, and handling ice inappropriately.⁸ These are crucial infractions meaning that they can pose an immediate hazard to the public and should be addressed and rectified as soon as possible. Otherwise, the premise at fault will be closed.⁸ In this study the served ice in Toronto food premises was assessed through microbiological analysis and related food handling practices.

Sampling procedure

Between September to November 2019, 25 food premises in Toronto were randomly selected for taking ice samples. The inclusion criteria were the premises with ice machines that serve the ice to the public. In order to take samples from these premises, an investigator from Ryerson University accompanied a certified public health inspector from Toronto Public Health. The investigator collected samples based on the water sample guideline provided by the University of Guelph's Agriculture & Food Laboratory.⁹

Microbiological analysis

The University of Guelph's Agriculture & Food Laboratory conducted total coliforms and E.coli microbial analysis of the collected ice samples based on Public Health Ontario's guideline for drinking water testing. According to Public Health Ontario, "Drinking water samples are tested by the Membrane Filtration method modified from MECP E3407: Membrane Filtration Method Using DC Agar for the Simultaneous Detection and Enumeration of Total Coliforms and Escherichia coli in Drinking Water for the microbiological indicators total coliform and Escherichia coli (E. coli)".¹⁰



Visual inspection

In addition to collecting ice samples from the randomly selected food premises in Toronto, an inspection was conducted to observe and study the food handling practices related to ice at these premises.

Each premise was observed based on a created table of ten criteria. These criteria are:

1. The operator's knowledge of cleaning the ice machine
2. Presence of biofilm in the ice machine
3. If the ice cubes have visible soil
4. If the ice was handled with a scoop
5. The cleanliness of the scoop
6. The appropriate storage of the scoop
7. The premises' history of conditional pass or fail over the past two years
8. Appropriate light and ventilation in the room where ice machine is kept
9. The cleanliness of the container used for transporting ice
10. The overall condition and maintenance of the ice machine

Microbiological results

Microbiological analysis	Premises with positive samples	Premises with negative samples	Total number of premises
E.coli	1	24	25
Total Coliforms	1	24	25

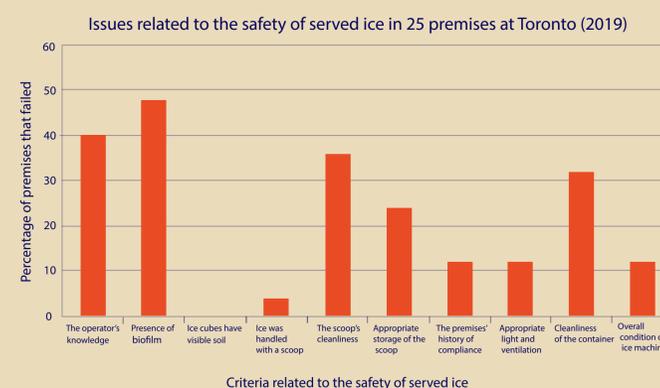
Table 1. Microbiological results from collected samples.

Visual inspection results

Criteria	Premises failed	Premises passed	Total number of premises
The operator's knowledge of cleaning the ice machine	10	15	25
Presence of biofilm	12	13	25
Ice cubes have visible soil	0	25	25
The ice was handled with a scoop	1	24	25
The scoop's cleanliness	9	16	25
Appropriate storage of the scoop	6	19	25
The premises' history of compliance	3	22	25
Appropriate light and ventilation	3	22	25
The cleanliness of the container used for transporting ice	8	17	25
Overall condition of the ice machine	3	22	25

Table 2. Visual inspection results

Visual inspection results



Discussion

Out of 25 ice samples, one (4%) was found with >80 cfu/100 mL of total coliform and 20 cfu/100 mL of E.coli. These ice samples were all connected to the municipal water provided by the city of Toronto. Regulation 169/03 of Ontario Safe Drinking Water Act does not accept any presences of total coliform and E.coli in municipal drinking water.¹¹ Thus, the >80 cfu/100 mL of total coliforms and 20 cfu/100 mL of E.coli detected in the ice sample indicates that the ice is not safe for consumption. Out of 25 premises 76% (n=19) had at least one issue pertaining to sanitary handling of ice. These results explain why more than 20 food premises over 2 years (October 2017 to October 2019) in Downtown Toronto Center and the Danforth area received conditional passes due to mishandling the served ice.⁸ Other than food premises, ice has also been a vector of pathogens in other establishments such as health care settings. A study from 5 hospitals and 2 nursing homes in Ohio also revealed that ice machines could be the source of other nosocomial pathogens such as Gram-negative bacilli and Candida Spp.¹²

Conclusions

In summary, served ice in food premises in Toronto can pose a risk of food-borne illness. The microbiological results of this study confirm that pathogens can be present in the served ice. Furthermore, the study's visual inspections verify the fact that some food premises in Toronto do not follow or don't have knowledge of the safe handling practices of served ice and hence, several of these premises have committed crucial infractions. Due to its high demand and usage, ice is served in many food establishments in Toronto and several studies show that various pathogens can be present in ice served in food and health care establishments. Therefore, an outbreak of virulent pathogens that can particularly harm vulnerable populations such as the immune compromised and children is possible.

References

1. International Packaged Ice Association. (2017). Ice facts and Myths. Retrieved September 30, 2019 from: <https://packagedice.com/ice-facts-myths/>.
2. Teixeira, P., Brandão, J., Silva, S., Babić, M. N., Gunde-Cimerman, N., Pires, J., Valério, E. (2019). Microbiological and chemical quality of ice used to preserve fish in Lisbon marketplaces. Journal of Food Safety, 39(4), n/a. doi:10.1111/jfs.12641
3. Francesca, N., Gaglio, R., Stucchi, C., De Martino, S., Moschetti, G., & Settanni, L. (2018). Yeasts and moulds contaminants of food ice cubes and their survival in different drinks. Journal of Applied Microbiology, 124(1), 188-196. doi:10.1111/jam.136241
4. Kassa, H., Harrington, B., Baroudi, K., & Silverman, G. S. (2017). Microbial quality of ice machines and relationship to facility inspections in the Toledo, Ohio, area. (ADVANCEMENT OF THE SCIENCE). Journal of Environmental Health, 80(4), 22-28.1
5. Government of Ontario. (1990). Health Protection and Promotion Act. Retrieved October 1, 2019 from: <https://www.ontario.ca/laws/statute/90h07>
6. Government of Ontario. (2017). Regulation 493/17. Food premises. Retrieved October 1, 2019 from: <https://www.ontario.ca/laws/regulation/170493>
7. Ministry of Health and Long-Term Care. (2018). A Guide for Ontario's Food Handlers. Retrieved October 1, 2019 from: http://www.health.gov.on.ca/en/pro/programs/publichealth/enviro/docs/training_manual.pdf
8. City of Toronto. (2019). Dine safe. Home page. Retrieved October 1, 2019 from: <https://www.toronto.ca/health/dinesafe/index.htm>
9. Agriculture & Food Laboratory, University of Guelph. (2019). Practices for the Collection and Handling of NON-REGULATORY Water Samples. Retrieved October 5, 2019 from: [https://afl.uoguelph.ca/sites/default/files/pdf/PracticesForTheCollectionAndHandlingofWaterNONregulatorySamples_2019Oct07%20\(1\).pdf](https://afl.uoguelph.ca/sites/default/files/pdf/PracticesForTheCollectionAndHandlingofWaterNONregulatorySamples_2019Oct07%20(1).pdf)
10. Public Health Ontario. (2020). Drinking Water Testing – Official Agencies. Retrieved February 7, 2020 from: <https://www.publichealthontario.ca/en/laboratory-services/test-information-index/drinking-water-testing-official-agencies>
11. Government of Ontario. (2002). Regulation 169/03. MICROBIOLOGI STANDARDS. Retrieved February 10, 2020 from: <https://www.ontario.ca/laws/regulation/030169>
12. Kanwar, A., Cadnum, J., Xu, D., Jenson, A., & Donsky, C. (2018). Hiding in Plain Sight: Contaminated Ice Machines Are a Potential Source for Dissemination of Gram-Negative Bacteria and Candida Species in Healthcare Facilities. Infection Control & Hospital Epidemiology, 39(3), 253-258. doi:10.1017/ice.2017.321