Surface Cleanliness of Shared Condiment Bottles in Toronto Burger Restaurants

A Preliminary Pilot Study

Ricky Huang, Melissa Moos, and Richard Meldrum
School of Occupational and Public Health and Safety, Ryerson University, Toronto, ON, Canada

Introduction

Every year 1 in 8 Canadians experience a foodborne illness and 60% of the cases are due to unknown causes.[1] Non-food contact surfaces in restaurants are an overlooked source of pathogens in inspections and investigations. Shared condiment bottles are non-food contact surfaces in restaurants and have the potential to be fomites by transferring pathogenic bacteria to consumers.

Previous Studies

Ontario Regulation 562 Food Premises s. 71(1) and 80 have vague standards for the cleaning of shared non-food contact surfaces like condiment bottles. It categorized condiment bottles as multi-service equipment and stated it had to be cleaned to 100 bacterial colonies.[2] The City of Toronto DineSafe program, Food Retail and Food Services Code, and the Ontario Public Health Inspector's Guide to Principles and Practices of Environmental Microbiology only state that non-food contact surfaces have to be cleaned. The cleaning frequency and cleanliness standards of condiment bottles are not clearly defined or standardized.

A table top cleanliness study in restaurants has shown that 70% of sampled table tops tested positive for total coliforms and 20% tested positive for *Escherichia coli* (*E.* coli).[3]

Menu cleanliness has been previously studied based on the different cleaning and storing practices of restaurants by testing for adenosine triphosphate (ATP) levels. ATP levels were higher before cleaning and when stored on tables, indicating higher organic soils and bacterial loads.[4]

Another previous menu cleanliness study has shown that 11% of bacteria present on shared restaurant menus can be transferred to consumers.[5]

Objectives

All shared condiment bottle surfaces are hypothesized to test microbiologically positive, indicating bacteria contamination. The main objectives of the study is to:

1. Determine the percentage of positive aerobic colony count (ACC) and compare findings to guidelines established by British Columbia Centre Disease Control (BC CDC).
2. Assess the cleaning procedures of Toronto burger restaurants.
3. Examine the number of contaminated condiment bottles with factors like storage, condiment type, cleaning practices, and bottle surface material.
4. Determine whether shared condiment bottles are a public health hazard.

Method

1. Randomly selected 10 Toronto burger restaurants through simple randomization sampling of the Toronto Public Health DineSafe list and randomly selected 5 condiment bottles from each restaurant.
2. 25 cm^2 surface area was aseptically swabbed from each bottle's handle part following the BC CDC guidelines and placed inside a cooler bag.[6] Information on time, date, condiment storage, surface material, and type of condiment were noted.
3. A questionnaire was conducted with each operator about their cleaning practices, storage methods, and if condiment bottles were shared.
4. Samples were cultured within 24 hours for ACC at the University of Guelph: Agriculture & Food Laboratory Services and results returned with quantitative data in total colony forming units/grams (total cfu/g).
5. Results were compared to the BC CDC's benchmark of 140 total cfu/g to assess for contamination.[6]
6. The number of positive ACC results and BC CDC contaminated samples were counted.

Results

•All 50 sampled condiment bottles were shared and cleaned as indicated by all 10 of the operators.

•47/50 (94%) of the samples tested positive for ACC and 3/50 (6%) of the results were negative for ACC (<10 total cfu/g).

•25/50 (50%) of the condiment bottle surfaces in Toronto burger restaurants were >140 total cfu/g (BC CDC guidelines) and were considered contaminated.

•14/25 (56%) of the contaminated condiment bottles were of the ketchup and hot sauce category (Table 1).

Table 1: Number of contaminated condiment bottles based on condiment type

Condiment Type	Number
Ketchup	**8**
Hot Sauces	**6**
Vinegar	**3**
HP Steak Sauce	**2**
Mustard	**1**
Relish	**1**
Mayonnaise	**1**
Other (Maple Syrup, Dressing, Honey)	**3**

•22/25 (88%) contaminated condiment bottles were made of plastic surface material and 3/25 (12%) of contaminated condiment bottles were made of glass surface material.

•12/25 (48%) contaminated condiment were stored at the back counter, 4/25 (16%) were stored on tables, and 9/25 (36%) were stored in the fridge.

•15/25 (60%) of the contaminated surfaces of condiments were cleaned only once a day or less than once a day as indicated by the operators (Table 2).

Table 2: Cleaning frequency compared for clean and contaminated condiment bottles

Cleaning Frequency (per day)	Number	
	Clean	Contaminated
Less than once	**1**	**4**
Once	**9**	**11**
Twice	**8**	**7**
Three or more times	**7**	**3**



Discussion

A majority of the condiment bottle surfaces in Toronto burger restaurants tested positive for aerobic colony counts, and 50% of the sampled condiment bottles were, by BC CDC established guidelines, contaminated. All the contaminated condiment bottles were shared and cleaned. However the presence of contaminated samples indicated that current cleaning practices are insufficient (Table 2).

This is a public health concern because condiment bottles are shared between consumers who use them prior to eating. This health hazard can transmit pathogenic facultative anaerobes such as *Salmonella, Escherichia coli,* and *Staphylococcus aureus.*[7] These pathogenic bacteria can then transfer onto the hands of consumers prior to food consumption.

Table top non-food contact surfaces are often overlooked during food outbreak investigations. Health protection agencies have to consider the control of every step from farm to fork. Effective cleaning practices and good hand hygiene are vital to eliminating condiment bottle surfaces as potential fomites for the transmission of illnesses.

Recommendations

1. The Ontario Public Health Inspector Guide should include clear procedures for sampling non-food contact surfaces and have interpretation criteria for environmental surface samples.
2. O. Reg 562 Food Premises should directly state requirements to control hazards of shared non-food contact surfaces like condiment bottles.
3. Health agencies should update inspection and investigation protocols to include condiment bottle surfaces.
4. Educating restaurant operators about the results of the study is recommended to improving overall public health knowledge and improving cleaning procedures of condiment bottles.

Conclusion

This preliminary pilot study suggests that microbiological contamination of shared condiment bottles is possible and can reach unsafe levels, thereby acting as a fomite for transmission of potentially pathogenic bacteria to consumers. Current standards do not include testing of non-food contact surfaces such as condiment bottles on a regular basis, which may pose a public health concern. Additional research should be conducted to determine the overall risk. Mitigating this source of pathogenic transmission can reduce foodborne outbreaks in Canada.

Acknowledgement

A special thank you to the following people for their contributions and support in leading to a successful research study; Chris MacDonald, Joseph Xavier, and Maruf Morshed of Toronto Public Health. They provided ongoing support by funding this project, providing their food safety expertise, providing access to the food premises, and transporting the samples to the University of Guelph.

References

[1]Government of Canada. (2016). Yearly food-borne illness estimates for Canada. *Government of Canada.* Retrieved from http://healthycanadians.gc.ca/eating-nutrition/risks-recalls-rappels-risques/surveillance/illness-estimates-estimations-maladies/yearly-annuel-eng.php. Date of access September 23, 2016
[2]R.R.O 1990, Reg 562: Food Premises s. 1(1), 71(1), 80
[3]Susana Yepiz-Gomez, M., Bright, K.R., & Gerba, C.P. (2006). Identify and Numbers of Bacteria Present on Tabletops and in Dishcloths Used to Wipe Down Tabletops in Public Restaurants and Bars. *Food Protection Trends.* 26: 24-40.
[4]Choi, J., Almanza, B., Nelson, D., Neal, J., & Sirsat, S. (2014). A strategic cleaning assessment program: Menu cleanliness at restaurants. *Journal of Environmental Health*, *76*(10), 18-24.
[5]Alsallaiy, I., Dawson, P., Han, I. and Martinez-Dawson, R. (2016), Recovery, Survival and Transfer of Bacteria on Restaurant Menus. *Journal of Food Safety*, 36: 52–61.
[6]BC Centre for Disease Control. (2010). Environmental Hygiene Monitoring A Guide For Environmental Health Officers. *BC Centre for Disease Control.* Version 3. Retrieved from http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/EH/FPS/Food/EnvMonitoringHygieneGuideforEHOs.pdf
[7]Vriesekoop, F., Russell, C., Alvarez-Mayorga, B., Aidoo, K., Yuan, Q., Scannell, A., ...Menz, G. (2010). Dirty money: an investigation into the hygiene status of some of the world's currencies as obtained from food outlets. *Foodborne Pathogens and Disease*, *7*(12), 1497.