ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.2555285

INTERNATIONAL JOURNAL OF RESEARCH – GRANTHAALAYAH
A knowledge Repository

Science

MICROBIAL LOAD AND EFFICAY OF ANTIMICROBIAL WIPES ON SHOPPING CART HANDLES, IN UNIAZAH CITY, ALQASSIM, K.S.A

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Abstract

Shopping carts are one of the most important tools for shopping in supermarkets. Shopping carts are used by hundreds of people each day and may be used 7 days per week and sometimes 24 hours per day. This study examined the amount of bacteria present on shopping cart handles before and after using antimicrobial wipes. 40 cart handles from 2 grocery stores in Uniazah city were swabbed. Cart handles were swabbed and then wiped with antimicrobial wipes and swabbed again and samples were transported to the laboratory. After incubation period of 24 hours at 37° C levels of bacteria were measured using a spectrophotometer with absorbency light at 686nm. 24 hours of incubation revealed that absorbency of swabs after antimicrobial wipes, on average was reduced to, about half, compared to, Swabs taken before, antimicrobial wipes. Also, the bacterial counts were less on the cart handles that wipe with antimicrobial wipes. It was concluded that the bacterial load, varied on the carts handles; and that the cart handles that were wiped with antimicrobial wipes had far less bacterial growth than the cart handles that were not wiped with antimicrobial wipes. Using antimicrobial wipes may be a way to reduce our exposure to harmful bacteria.

Keywords: Bacterial Load; Antimicrobial Wipes; Shopping Cart Handles; Uniazah City.

Cite This Article: Amjad Mohammad AL Felaiw, and Dr. Sarah Ali. (2019). "MICROBIAL LOAD AND EFFICAY OF ANTIMICROBIAL WIPES ON SHOPPING CART HANDLES, IN UNIAZAH CITY, ALQASSIM, K.S.A." *International Journal of Research - Granthaalayah*, 7(1), 269-275. https://doi.org/10.5281/zenodo.2555285.

1. Introduction

Shopping carts are one of the most important tools for shopping in supermarkets. They help you gather your household and personal supplies, and transfer your purchases throughout the store and out to your car parking space. Shopping carts are used by hundreds of people each day and may be used 7 days per week and sometimes 24 hours per day.

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But modern shopping carts require good design, regular maintenance and care to do their job safely. Recent studies have shown that shopping carts are often contaminated with a wide variety of bacteria and viruses. Shopping carts are constantly exposed to bacteria and germs from a variety of sources such as raw meat or poultry, children's hands while sitting the in child seat of the cart and other shoppers' illnesses. Listeria, Salmonella, Staphylococcus, Escherichia Coli, and other pathogenic bacteria, some of the bacteria, which can cause illness. Researchers stress that some shopping cart handles are more contaminated with bacteria than most public restrooms. So the aim of this study was to examine the amount of bacteria present on shopping cart handles before and after using antimicrobial wipes.

2. Research Objectives

1) To determine the amount of microbial load and effect of antimicrobial wipes on shopping cart handle in Unaizah City, Qassim, K.S.A.
2) To determine the amount of bacterial load present on all collected samples by using spectrophotometer.
3) To compare the difference of bacterial load on handles before and after using antimicrobial wipes.
4) To create awareness about hand hygiene and the importance of placing antimicrobial wipes at the entrance of shopping stores.

3. Methodology

Overview of the Study Design

This was an observational study using cross-sectional study design. This study was done to assess the effect of antimicrobial wipes on shopping cart handles and to create awareness in general population in all age group in Qassim region about importance of hand hygiene during shopping. The study included collection of several shopping carts samples in Uniazah city and testing them in Qassim University Microbiology Laboratory by using spectrophotometer. The exposures were antimicrobial wipes, climate, hand hygiene, temperature and humidity and the outcome was amount of bacteria present in shopping cart handles samples. The study was conducted during the period of *September 2017 to Junuary2018* in uniazah city.

Study Sample

This study was conducted on shopping stores in Qassim Region (Uniazah City). Sample size will include 40 shopping cart handles swab samples (N= 40). Shopping carts handles from grocery shops in qassim region were included, while shopping carts from other shops were excluded.

Data Collection

Data were collected from randomly tested samples in Qassim Region in sterile cotton transport swab labeled with ID number, Date, Time, Collector name. Collection of samples was done in two parts, First, 20 samples were swabbed from shopping cart handles without antimicrobial wipes. Then the other 20 samples were taken from the same carts handles after swabbed with antimicrobial wipes. Collection of cart handle data began with the swabbing of the cart handles. A sterile swab was taken out of its transport media and wiped across the top and bottom of the cart handle. Swabbing was done in the same manner for all carts. Each 20 cart handles were wiped

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with one antimicrobial sheet per cart and swabbed again after two to three minutes so to let the handle dry. The swabs were transported immediately to the laboratory. The collected swabs were transferred into test tubes, of sterile nutrient broth, which were incubated for 24 hours at 37°C. After the incubation of 5ml, samples from each test tube were poured into disposable cuvettes and placed in the spectrophotometer. Once the cuvette had been placed in the spectrophotometer, the wavelength was set to 686 nm (Brown, 2005). The spectrophotometer was set to zero and then blanked with a sample containing a sterile swab and nutrient broth that was incubated for 24 hours. The spectrophotometer was then set to zero and ready to read 100%. A single beam of light was sent through the sample and a reading determined how much light was absorbed by the sample. Bacteria absorb light, so the more light absorbed the greater amount of bacteria.

Statistical Analysis Plan

Data was analysed using, a one-way ANOVA test between the shopping carts with the antimicrobial wipe (A) and the carts without the antimicrobial wipe (B). This was done to determine the statistical difference between data A and data B. An Tukey test was performed to give a confidence interval and determine what difference there are between the two groups of data.

Ethical Considerations

Ethical approval for this study was obtained from Qassim University, College of Applied Medical Sciences, Departmental Research Review Committee; verbal consent was obtained from administrators of shopping stores for their participation in this study.

4. Results

Results were obtained by swabbing grocery cart handles in two different stores (A and B). Ten cart handles from each store were swabbed before and after wiping the cart handles with an antimicrobial wipe at each store. After 24 hours of incubation of swabs in nutrient broth at 37°C level of bacteria was measured by spectrophotometer at 686 nm wavelength**. (Table No.1)**

Table 1: Shows the amount of bacteria in each cart before and after using antimicrobial wipes in two stores (A and B). each store swabbed with ten samples before and after.

Cart No.	Absorbance Before using A.M.W	Absorbance After using A.M.W	Negative Control	Positive control/staph	Positive control/E.coli
1	0.070	0.035	0.00	0.141	0.190
2	0.193	0.037			
3	0.071	0.017			
4	0.155	0.025			
5	0.115	0.049			
6	0.125	0.067			
7	0.119	0.083			
8	0.236	0.164			
9	0.183	0.006			
10	0.165	0.054			
11	0.272	0.103			
12	0.082	0.004			

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13	0.113	0.009			
14	0.165	0.047			
15	0.246	0.025			
16	0.125	0.087			
17	0.115	0.026			
18	0.165	0.053			
19	0.122	0.070			
20	0.85	0.009			

A.M.W: refer to Anti-microbial wipes.

Negative control refers to sample containing a sterile swab and nutrient broth that was incubated for 24 hours at 37°C.

Positive controls refers to staph and E. coli sample each inoculated in nutrient broth and incubated for 24 hours at 37°C. samples were measured using spectrophotometer at 686 nm absorbency.

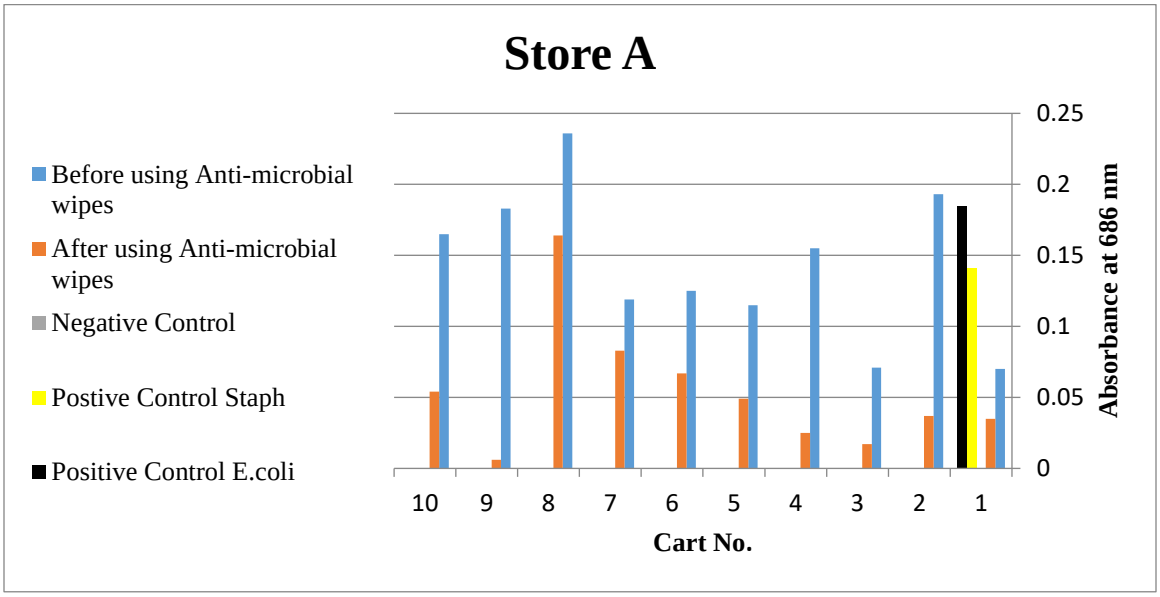

Figure1: Store A, shows the amount of bacteria in each cart before and after using antimicrobial wipes. Results of the data shows that when wiping the carts with antimicrobial wipes it is registered as negative values which means the amount of bacteria will be less comparing with the carts that doesn't wipe with antimicrobial wipes. Negative control refers to sample containing a sterile swab and nutrient broth that was incubated for 24 hours at 37°C. Positive controls refers to staph and E.coli sample each inoculated in nutrient broth and incubated for 24 hours at 37°C. samples were measured using spectrophotometer at 686 nm absorbency.

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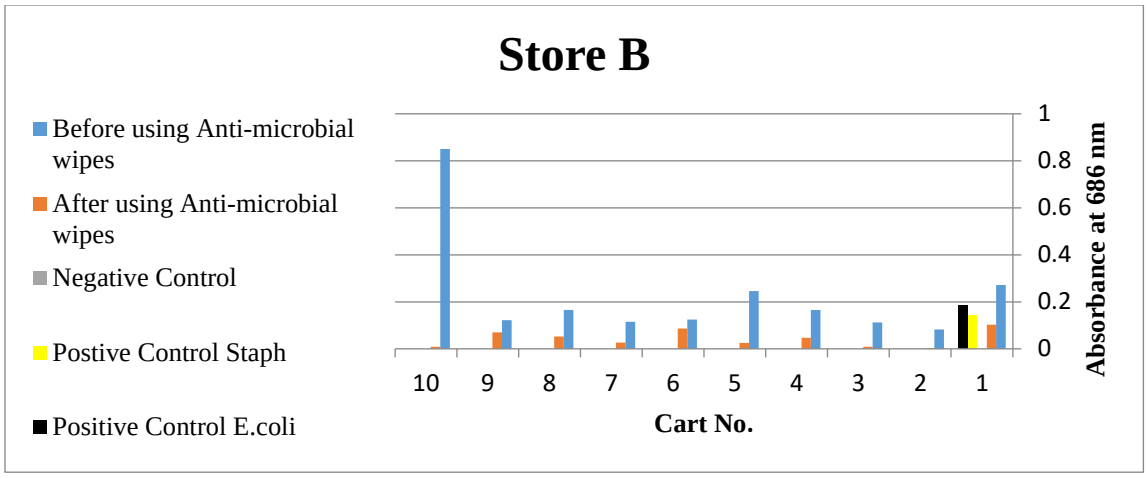

Figure 2: Store B, shows the amount of bacteria in each cart before and after using antimicrobial wipes. Results of the data shows that when wiping the carts with antimicrobial wipes it is registered as negative values which means the amount of bacteria will be less comparing with the carts that doesn't wipe with antimicrobial wipes. Negative control refers to sample containing a sterile swab and nutrient broth that was incubated for 24 hours at 37°C. Positive controls refers to staph and E.coli sample each inoculated in nutrient broth and incubated for 24 hours at 37°C. samples were measured using spectrophotometer at 686 nm absorbency.

Table 2: Show number of bacteria/ml in each cart before and after using antimicrobial wipes.

Cart No.	Absorbance Before using A.M.W	NO. Bacteria cell/ml	Absorbance After using A.M.W	NO. Bacteria cell/ml
1	0.070	14 million/ml	0.035	7 million/ml
2	0.193	38 million/ml	0.037	7,500,000/ml
3	0.071	14 million/ml	0.017	2 million/ml
4	0.155	30 million/ml	0.025	4 million/ml
5	0.115	22 million/ml	0.049	8 million/ml
6	0.125	24 million/ml	0.067	12 million/ml
7	0.119	23 million/ml	0.083	16 million/ml
8	0.236	46 million/ml	0.164	32 million/ml
9	0.183	36 million/ml	0.006	1 ,600,000/ml
10	0.165	32 million/ml	0.054	10 million/ml
11	0.272	54 million/ml	0.103	20 million/ml
12	0.082	16 million/ml	0.004	1,400,000/ml
13	0.113	22 million/ml	0.009	1,900,000/ml
14	0.165	32 million/ml	0.047	8 million/ml
15	0.246	48 million/ml	0.025	4 million/ml
16	0.125	24 million/ml	0.087	16 million/ml
17	0.115	22 million/ml	0.026	4 million/ml
18	0.165	32 million/ml	0.053	10 million/ml
19	0.122	24 million/ml	0.070	14 million/ml
20	0.85	160 million/ml	0.009	1,900,000/ml

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Source of Variation	SS	df	MS	F	P-Value	F Crit
Between groups	0.184552225	1	0.184552225	12.63	0.001034	4.098172
Within groups	0.55527955	38	0.01461262			
Total	0.739831775	39				

P-Value = 0.001034(Significant).

Table 2: An ANOVA test was performed and showed a statistically significant difference between the absorbance of samples from cart handles from both stores (A and B) before and after using antimicrobial wipes after 24 hours of incubation at 37° C.

(F= 12.629; DF= 1; p= 0.00103), since p-value < alpha value (0.005) it shows rejection of null hypothesis; Ha: M1≠M2.

The results of a Tukey multiple comparisons test at 95% confidence interval showed significant differences between cart handles with and without antimicrobial wipes, cart handles that swab without using antimicrobial wipes having higher levels of bacterial growth overall.

5. Discussion

The results of this study showed that the shopping cart handles in the grocery store that were wiped with an antimicrobial wipe had lesser bacterial load, on the handles compared to unwiped handles. Samples from store A and B were incubated at 37°C for 24 hours and tested using a spectrophotometer.

A study by parrish, the results suggested that the large difference in absorbency between store A (antimicrobial wipes available) and store B(antimicrobial wipes not available) could be contributed to the use of antimicrobial wipes. The low level of use of antimicrobial wipes does not seem to support the conclusion that the wipe use is responsible for the lower bacteria amounts. It could be that a small amount of shoppers using the wipes is sufficient to bring bacteria levels down. It also could be that the total amount of shoppers at the store B is larger than store A, but when he looking at the amount of traffic at the two stores this does not seem to be the case. He finds that Store A seems to have a larger amount of traffic than store B. It is education of the consumer that is needed to combat potential food borne illnesses (Medeiros *et al*. 2001).

6. Conclusion

Our results confirmed that the bacterial load varied, on cart handles, and that the cart handles wiped with antimicrobial wipes had far less bacteria than the cart handles samples taken before without antimicrobial wipes. We recommend that shops should provide antimicrobial wipes to customers, at entry point.

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