Overall Microbial Activity on Shopping Carts Handles: Relationship with Ambient Temperature, Relative Humidity, Moisture, and Ultraviolet Radiations

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Overall Microbial Activity on Shopping Carts Handles: Relationship with Ambient Temperature, Relative Humidity, Moisture, and Ultraviolet Radiations

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INTRODUCTION

• Microbes are often present on many common outdoor objects.
• When we touch shopping cart handles by bare hands in grocery stores, which are touched by other customers from different hygienic conditions then we might be compromised to microbial infections.
• Previous studies reported that 80% of infections are spread through hand to hand contact or hand to other object contact [1].
• Microbial contamination on shopping cart handles were previously reported, such as observing certain infectious bacteria on shopping cart handles and seats [2].
• Several studies have been conducted on this topic but how the microbial load on shopping cart handles vary in different seasons and its relationship with ambient temperature (T), relative humidity (RH), surface moisture, and ultraviolet radiations (UV) are largely understudied.

Specific Aims: This study aims at exploring microbial loads on shopping cart handles at three grocery stores during fall and winter and its relationship with real-time T, RH, surface moisture, and UV levels. We predict that microbial loads will be highest during the winter, due to the colder temperature increasing excess body fluids and those fluids contaminating the cart handles.

METHODS

• Shopping cart handles from three grocery stores were used for the research. Customers placed their carts into the receptacles and were then immediately taken out and used for sampling.
• Prior to microbial load sampling, surface moisture level on the cart, along with T and RH were measured using the FLIR MR176 Imaging Moisture Meter Plus with IGM and a thermohygrometer pen.
• UV levels were measured using the EXTECH UV505 UV-AB Light Meter. To assess microbial load on cart handles, ATP levels were monitored using the hygiena SystemSURE Plus luminometer for results.
• The swabs were then placed into the hygiena SystemSURE Plus swabs for results.
• Ten samples were taken during the morning, noon, and evening hours at each of the three stores for both fall and winter months. Overall microbial load for the fall was compared to overall microbial load for the winter.
• T, RH, surface moisture, and UV data were also analyzed.

RESULTS

Figure 1: Microbial activity on shopping cart handles during winter and fall in terms of surface ATP levels. The lower and upper boundaries of the boxes specify the 25th and 75th percentiles, respectively. The line within the boxes indicates the median and the whiskers above and below the box indicate the 95th and 5th percentiles, respectively. The differences between seasonal data were calculated by paired t-tests.

CONCLUSIONS

• Average ATP values in shop # 1, 2, and 3 ranged from 5 - 48.9, 4.2 – 24.6, and 7.8 – 96.2 RLU/cm² in the winter and 30.1 - 64.2, 69.8 – 148.8, and 11.2 – 96.7 RLU/cm² in the fall, respectively.
• Our collected data showed that overall microbial activity on shopping cart handles in fall were significantly higher than winter for two shops (paired t-tests; p<0.05).
• Non-parametric spearman correlation analyses showed statistically significant positive correlations between overall microbial activity and temperature as well as moisture. However, for relative humidity this correlation was negative.
• Compared to previous research published by other researchers, the research conducted by us was to examine whether overall microbial activity on shopping cart handles vary in different seasons and its relationship with T, RH, surface moisture, and UV radiations.
• One of the previous studies looked for certain bacteria on shopping carts while the other looked at the life expectancy of flu germs on shopping carts [3]. Our study is somewhat unique because we have examined the overall microbial activity first time.
• Our research conducted supported our initial hypothesis that microbial activity on shopping cart handles differs in varying seasons.
• Further research recommendations include taking UV samples when collecting each microbial sample from the shopping carts.
• Limitations: A limitation of this study is its small sample size.

REFERENCES


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