

Investigation on the Effectiveness of Clorox® Disinfecting Wipes on Common Marketplace Microbes

For
Professor Karelia Stetz-Waters
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August 8, 2010

2710 Park Terrace
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August 8, 2010

Ms. Karelia Stetz-Waters
Linn-Benton Community College
6500 Pacific Blvd, SW
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Dear Ms. Stetz-Waters:

Enclosed is our report, "Investigation on the Effectiveness of Clorox® Disinfectant Wipes on Common Marketplace Microbes". We believe that the results of this study will demonstrate to local businesses the value of offering sanitation products to their customers and the need to review their own regulations for cleansing their equipment.

In conducting our research we found it quite difficult to achieve quantitative analyses due to our lack of access to a biology laboratory. As such, all results herein are qualitative in nature. Had we access to a laboratory and equipment a further analysis of exactly what types of microbes we collected could be performed.

The research and writing of this paper were extremely interesting. In our preliminary study we read the reports of others that had conducted this manner of research before, but actually seeing it for ourselves was something else entirely. Individuals that we have shared our research with have taken notice.

Please feel free to direct any questions, comments, or concerns with this report to either lord_brend354@hotmail.com or pagingpatrice@comcast.net.

Sincerely,

Matthew Bledsoe and Patrice Bledsoe-Wright

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ABSTRACT

Businesses need to clean their equipment more often to protect consumers from contact transmission of harmful microbes. There have been recent studies proving an abundance of bacteria on shopping carts as well as on ATM and elevator buttons, escalator rails, telephones, and other items the average person uses every day. The authors of this report studied the available research and conducted experiments of their own. Their experiments supported the research: Local shopping carts and ATM buttons are deeply infested with microbes. This research further confirmed that anti-bacterial wipes, such as Clorox® Brand, do kill bacteria, thereby protecting consumers. The authors discovered other means of consumer protection available, as well, such as a disposable shopping cart liner and a carwash type cart wash. Consumers would benefit from requesting the businesses they frequent protect their customers by providing at least one type of these sanitary options. Should business fail to honor this request, consumers must take responsibility for their safety and their own disinfectant wipes.

INTRODUCTION

Recent studies have shown that many often frequented public locations are microbially hazardous, even more so than public restrooms. Such locations include multiple parts of a shopping cart, ATM buttons, and escalator handrails. Rarely cleaned, much less sanitized, these locations become breeding grounds for multiple forms of illness.

A study conducted by researchers at the University of Arizona showed that shopping carts do contain numerous hazards from contact with such things as raw meat, dirty diapers, and bodily fluids. Because stainless steel is non-porous, contact transmission occurs easily. Hazards that are not uncommon included:

- *Escherichia coli*
- *Staphylococcus aureus*
- *Streptococcus pneumoniae*
- Hepatitis B
- Salmonella
- *Campylobacter jejuni*
- Common flu virus

Similarly, these microbes can be found on such modern conveniences as ATM buttons, escalator rails, elevator buttons, and restaurant menus.

Microbes can cause illness. More and more bacteria have evolved such that they are resistant to the many antibiotics on the market today. MRSA, which was once confined to hospitals, is on the rise in the community.

Businesses have begun to provide disinfecting products for their consumers to use for their protection. Such products, that are easy to provide and simple to use, include disinfecting wipes and gel hand sanitizers.

Because a local grocery store provides Clorox® Disinfectant Wipes, the authors of this report tested the effectiveness of Clorox® Disinfectant Wipes on that store's shopping carts as well as on carts belonging to another local store that does not provide protection for their consumers. They found those wipes to be effective in killing bacteria. They also discovered other means which are effective in protecting the consumer against microbes, including a disposable shopping cart liner and a carwash type cart wash.

COLLECTED DATA

Methods of bacterial transference

When talking about shopping carts specifically, there are many methods of microbe transference. Not only do people touch portions of the cart with their hands, but the carts come into direct contact with food products and children.

Food Products. Containers of food products are liable to leak allowing blood or sugary liquids to contaminate the cart. Blood from raw meats can contain both *Salmonella* and *Escherichia coli*. Sugary liquids, when allowed to remain on a surface and become exposed to bacteria, will become a breeding ground for the microbes.

Children. Children are dirty. Children, especially young children, explore their world with their hands. They touch almost anything without regard for where the item has been. They do not think of cleansing their hands before touching their mouths, eyes, noses or other items. Children under two years of age touch their hands to their faces 30 to 40 times per hour (Tucson Weekly). Non-toilet trained children defecate or urinate wherever they happen to be. Any child with an overly full diaper could have seepage, contaminating the shopping cart with urine or fecal matter. This is especially problematic when the next store customer places a food item such as produce on this contamination.

Hand Contact. Generally speaking, humans manipulate their world via touch. Western cultures use touch as a form of greeting, be it a handshake, a hug, etc. Without proper sanitary measures however, this is problematic. A study performed by Dr. Fabien Squinazi, director of the Laboratory of Hygiene of the City of Paris, in December, 2006, and January, 2007, showed that of the participants in the study, approximately 75% had germs on their hands after shaking hands with a contaminated person. Two-thirds of those who tested positive for germs had fecal *E. coli* on their hands. These results were considered shocking enough that the experiment was performed again. In the second study a larger group was selected for trials. Roughly the same percentage acquired germ contamination after the handshake, but only 50% had fecal bacteria. Taking this second study a step further, Dr. Fabien waited two hours and then took samples from the lips of the study group. At that time 39% of the study group tested positive for fecal bacteria. ("Wash Your Hands")

University of Arizona Study

In 2007 Dr. Charles Gerba from the University of Arizona at Tucson conducted a study to determine the extent of microbe contamination in various locations. Locations included airline lavatories, vacuum cleaner bristles, office water cooler handles, office coffee cups, cell phones, kitchen sponges, kitchen sinks, shopping carts, and public swimming pools. The bacteria that Dr. Gerba's study found in these locations were:

- *Escherichia coli*
- *Staphylococcus aureus*
- *Streptococcus pneumoniae*
- Hepatitis B
- *Salmonella*
- *Campylobacter jejuni*
- Common flu virus

Dr. Gerba's current focus of study concerns the extent of Methicillin-Resistant *Staphylococcus aureus* or MRSA.

MRSA

Bacteria have long been known to mutate for self preservation. Within two years of the 1936 release of Sulfa and the 1945 mass production of Penicillin, strains of bacteria resistant to those antibiotics were being discovered. In a 1951 study, conducted by Joshua and Esther Lederberg of the University of Wisconsin, bacteria were conclusively proved to be mutating in response to drugs rather than by gaining a gradual tolerance, as had been previously believed. (Good Germs, Bad Germs). Nosocomial transmission began to be widely seen in the 1960's with *S. aureus* as the usual culprit. Hospitals were found to be passively breeding their own strains of bacterium. These antibiotic infused environments and their imperfect sanitation practices were breeding a super hardiness and the resulting strains could last for weeks on hospital surfaces. Methicillin was developed to fight penicillin resistant bacteria. However *S. aureus* became resistant to it as well and Vancomycin was developed as the "drug of last resort" to fight MRSA. (Good Germs, Bad Germs)

CA-MRSA. The strain of MRSA that is out in the community is called CA-MRSA. Community-Associated MRSA is much easier to spread than typical MRSA. CA-MRSA can be spread by contact with infected skin, by touching mucous membranes of an infected person, or if the infected person touches these areas and then touches something else leaving the bacteria behind. (Tucson Weekly)

Local Research

Shopping Carts. For our local shopping cart research we chose to collect samples from grocery carts at the Fred Meyer Retail Store in Albany, and at WinCo Foods in Corvallis. Fred Meyer has been offering sanitary wipes to their customers for some time, whereas WinCo has been asked to provide something similar and has stated that they will not. When asked what kind of wipes Fred Meyer offers its customers, the

Manager stated that they were regular Clorox® Disinfecting Wipes that one can purchase from their store. Using sterile technique we took samples from two carts, chosen at random, from both stores. Our first samples were from a “dirty” cart and our second samples were taken from the same cart after having been disinfected by the Clorox® Wipes. We took samples from two locations on each cart, the handle, both plastic and metal portions, and from the plastic fold down seat.

We allowed the samples to grow in culture for a period of three days, at the end of which we photographed the results. Figures 4-1 through 4-4 are images of the WinCo cultures.

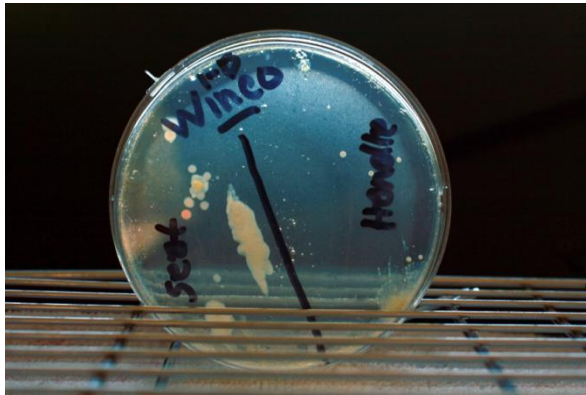


Fig. 4-1: Cart 1 Pre-Disinfection

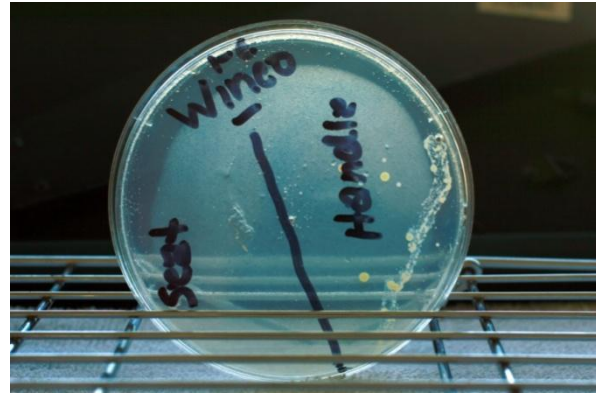


Fig. 4-2: Cart 1 Post-Disinfection

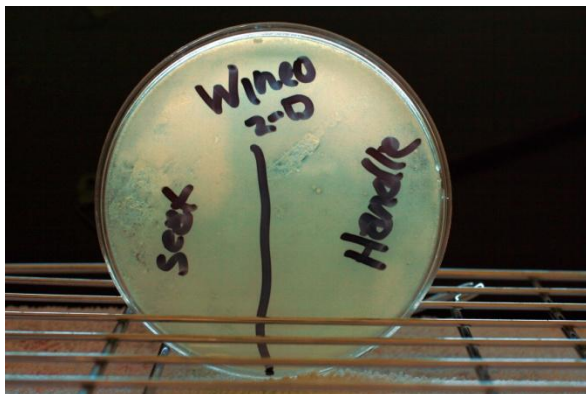


Fig. 4-3: Cart 2 Pre-Disinfection

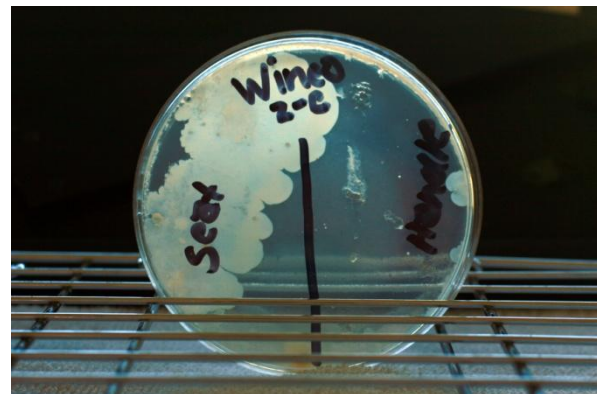


Fig. 4-4: Cart 2 Post-Disinfection

Clearly the disinfecting wipes made a huge impact on the number of bacteria colonies present. Figure 4-1 in the seat area shows at least three different types of bacteria with multiple massive colonies of the beige colored bacteria. Figure 4-2 shows that, after disinfection, there were hardly any bacteria colonies at all. Figure 4-3 shows a swarm of bacteria that was too congested to identify colonies from both the seat and the handle areas. After cleaning there was still bacteria present; however, there was a marked improvement in the number.

As previously stated, we also took cultures from Fred Meyer, following the same sterile technique. After allowing the samples to grow in culture for a period of three days, the results were photographed. Figures 5-1 through 5-4 are images of the Fred Meyer cultures.



Fig. 5-1: Cart 1 Pre-Disinfection

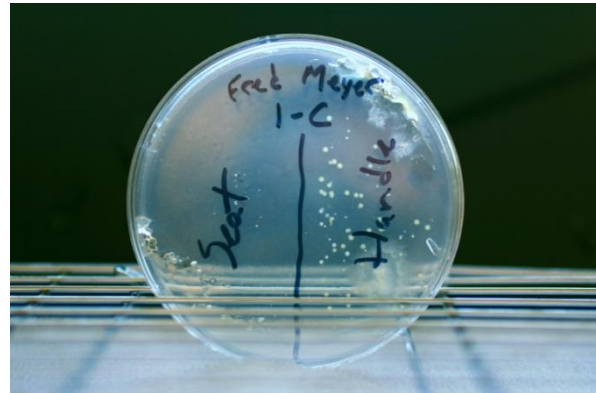


Fig. 5-2: Cart 1 Post-Disinfection



Fig. 5-3: Cart 2 Pre-Disinfection

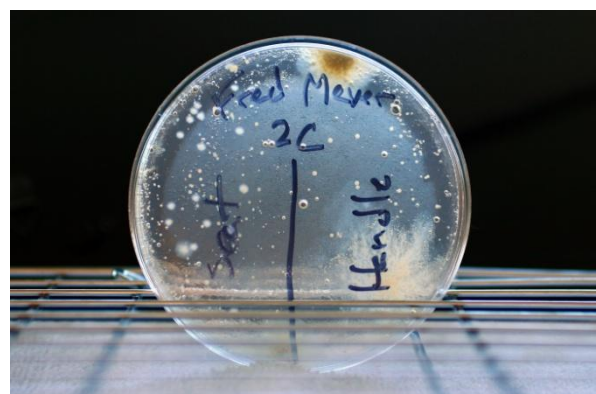


Fig. 5-4: Cart 2 Post-Disinfection

Figures 5-1 and 5-3 show the seat and handle areas of the two carts we sampled prior to disinfecting. We had expected these cultures to be cleaner because Fred Meyer does provide disinfectant wipes free of charge for their customers to use; however, we have also noticed that not every customer takes advantage of this service. Therefore, we knew it was possible a large number of bacteria would grow. While the bacteria present was significant, neither cart presented as many bacteria as cart #2 from WinCo. After disinfecting the carts and taking another culture, we saw a significant reduction in the number of bacteria, as shown in Figures 5-2 and 5-4.

ATM Keypads. For our research we chose the ATMs at the West 29th Street Branch of Central Willamette Credit Union and at the 7-Eleven Convenience Store at Pacific Boulevard and Belmont Street. Using sterile technique we took “dirty” samples and “clean” samples after wiping the keypads down with the disinfecting wipes. The keys we chose to sample were the number five key, because it is located in the middle of the keypad, and the Enter key, because it gets the greatest usage.

After allowing the samples to grow in culture for a period of three days we photographed the results. Figures 6-1 and 6-2 are images of the Central Willamette Credit Union cultures. Figures 6-3 and 6-4 are images of the 7-Eleven ATM cultures.

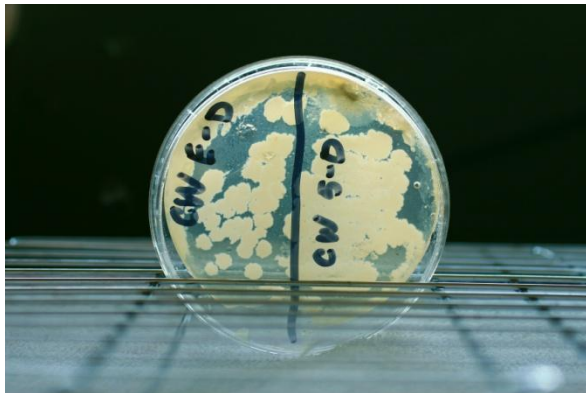


Fig. 6-1: Central Willamette ATM Pre-Disinfection



Fig. 6-2: Central Willamette ATM Post-Disinfection

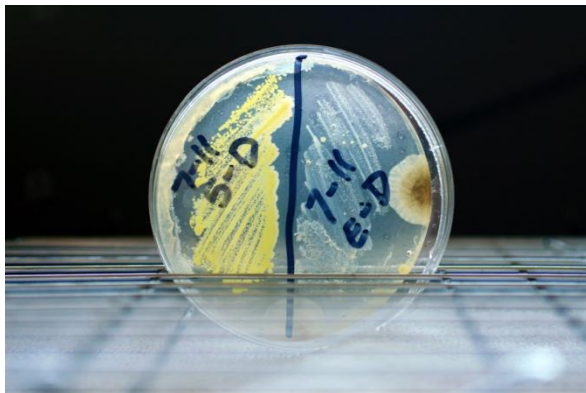


Fig. 6-3: 7-Eleven ATM Pre-Disinfection



Fig. 6-4: 7-Eleven ATM Post-Disinfection

After the three day growth period, we were surprised to see the cultures obtained from both number five keys presented a greater microbial growth than the cultures we obtained from the Enter keys. Figures 6-1 and 6-3 show the growth from these keys. The plates that contained post disinfection samples from the same keys still show some bacterial growth, but the number is significantly less, as shown in Figures 6-2 and 6-4.

Alternative Safety Practices

PureCart® Cart Wash. PureCart® Systems of Green Bay, Wisconsin, has developed a cart wash that is a total shopping cart cleaning system. The cart wash, pictured in figure 7-1, mists shopping carts with a disinfecting peroxide solution as they are pushed through. The company claims that their system will kill 99.99% of germs on the cart. These machines are rented from the company at approximately \$7,500 per year.



Fig. 7-1: Steve Hendrix, *Washington Post*

SmartLiner™. Tom Gryniewicz was led to develop this disposable shopping cart liner after his young daughter developed a respiratory illness from bacteria she contracted from a shopping cart. The SmartLiner™ can easily be installed in a shopping cart with one hand and provides a barrier between bacteria and the areas that children and adults come into most frequent contact with. The liners are provided to retailers for free as they generate revenues by selling advertising spots on the liner itself. These advertising slots also provide the consumer with money saving coupons.



Fig. 7-2: Seth Mendelson, *Grocery Headquarters*

Babe Ease, LLC. Clean Shopper. As an alternative to products that the retailer provides the customer, there are also products available for the consumers to purchase and bring for their own use. One such product is made by Babe Ease, LLC of Pelham, New Hampshire. The Clean Shopper and Chic Clean Shopper products are different models of a fabric coverlet that is placed over the hand rail, child seat, and child seat backrest. This provides a barrier between the shopper and the actual shopping cart, or a child and the shopping cart. These products sell for between \$29 and \$36.



Fig. 7-3: www.cleanshopper.com

CONCLUSION

Summary of Findings

Shopping Carts are shown to be a breeding ground for bacteria. Some stores are taking active steps to protect their consumers. On every one of our trials, the surfaces showed a marked reduction in microbial population after being wiped down with the Clorox® Disinfecting Wipes. Not only are there measures for protection available for the retailer to emplace but there are protection measures available for the consumer to provide as well.

Recommendations

Retailers that are already providing sanitation methods to consumers should continue to do so. Those retailers that have refused to do so despite their patrons requests should begin to offer them. All retailers should consider the addition of cart washes or at the least a barrier method. Consumers need to take responsibility as well, and there are products that will allow them to do so.

Dr. Gerba has said, "Good hygiene has prevented more disease than every vaccine and antibiotic ever invented" (Tuscan Weekly). Parents should take their hygiene, and the hygiene of their children, very seriously.

GLOSSARY

***Campylobacter jejuni*:** The most common cause of bacterial food borne illness. Symptoms include diarrhea (often bloody), abdominal pain, fever, malaise, and vomiting. Severity of illness varies, but most people recover completely within ten days. *Campylobacter* is found in wild and domestic animals, including cattle, sheep, goat, pigs, chicken, duck, and geese.

***Escherichia coli*:** *E. coli* lives normally in the intestinal tract of humans and animals. Some strains are beneficial but many are harmful, causing gastrointestinal and urinary tract infections. Food that can be infected by animal manure can carry the bacteria, including such foods as ground beef, unpasteurized fruit juice or milk, raw vegetables and water. *E. coli* bacteria can live for weeks on a surface. Healthy adults generally recover completely from an *E. coli* infection, but it is extremely serious in children and the elderly. Symptoms of the disease include diarrhea (often bloody), cramping, nausea, vomiting, and kidney failure.

Hepatitis B: Hepatitis B is a disease that causes chronic inflammation of the liver and leads to liver failure. It is caused by the Hepatitis B virus, for which there is a vaccine. In severe cases the symptoms can be treated and slowed down by medication, but transplant often becomes necessary. Hepatitis B is spread through contact with an infected person's body fluids.

Nosocomial: Any disease or infection that was acquired while under medical care, usually in a hospital.

Microbe: Any form of life that must be seen under the microscope is called a microorganism, which may be harmful or helpful. Microbes are microorganisms that are generally harmful; examples are bacteria, fungi, virus, or protozoa.

Salmonella: A bacterium that is one of the most common causes of food borne illness. Contamination occurs from food such as undercooked eggs, ground beef or chicken. Symptoms occur anywhere between six hours and three days after ingestion of bacteria, and include diarrhea (may be bloody), cramping, vomiting, fever, headaches, and muscle and joint pain. Salmonellosis can be life-threatening for children and the elderly.

***Staphylococcus aureus*:** The most common cause of staph infection, *S. aureus* causes pimples, impetigo, boils, carbuncles and abscesses. It can also be responsible for pneumonia, meningitis, osteomyelitis, toxic shock syndrome, and septicemia. It is usually found in the nose and approximately 20% of the population is long-term carriers. *S. aureus* is one of the five most common causes of Nosocomial infections today, causing post-surgical infection.

***Streptococcus pneumoniae*:** A major cause of pneumonia, *S. pneumoniae* also causes many other diseases such as acute sinusitis, meningitis, otitis media, bacteremia, sepsis, osteomyelitis, septic arthritis, cellulitis, and peritonitis. *S. pneumoniae* is the leading cause of bacterial disease in children and in the elderly.

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