

Bacterial and Viral Health Hazards of Reusable Shopping Bags

WHAT PROPONENTS OF BAG BANS WILL NEVER TELL YOU – THE DANGERS LURKING ON THE INSIDE AND OUTSIDE OF THOSE REUSABLE SHOPPING BAGS

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Introduction

The reusable shopping bag has been touted as an environmentally friendly alternative to plastic and paper disposable carry out bags. But is it? Proponents always mention the advantages of the reusable bag but fail to mention the disadvantages. For example, if reusable shopping bags are not washed on a regular basis, there will be a buildup of bacteria, yeast, mold, and coliforms which if they come in contact with food items could be a potential health hazard. In addition, viral health hazards also exist where the use of reusable shopping bags may be a potential factor in disease transmission. Washing shopping bags on a regular basis will maintain them in a sanitary condition. Additional precautions may be necessary in the event of an epidemic.

Health Hazards and the Summerbell Study

Two different studies have been conducted by microbiologists to determine if any health hazards exist with the use of reusable bags to carry groceries and other food items. The first study, also known as the Summerbell Study, was conducted by Dr. Richard Summerbell in Toronto, Canada. (Summerbell, 2009) The study tested 49 “used” reusable shopping bags which revealed the following:

- 64% of bags tested had some level of bacteria
- 30% of bags tested had elevated bacterial counts
- 24% of bags tested showed presence of mold
- 20% of bags tested indicated the presence of yeast
- 12% of bags tested had an unacceptable coliform count

The study concluded that “reusable grocery bags can become an active microbial habitat and a breeding ground for bacteria, yeast, mold, and coliforms.” The study also noted that the presence of yeast and mold may be of concern for people with compromised immune systems or allergies. In addition the study concluded that the use of reusable bags as a multi-purpose tote is a cause for concern particularly if used to transport gym clothes or dirty diapers. The study also recommended that reusable bags be periodically replaced to prevent bacteria buildup. In addition, the study showed that plastic carryout bags and a brand new reusable bag showed no evidence of bacteria, mold, yeast, and total coliform.

Health Hazards and the Loma Linda Study

The second study was conducted by the Department of Soil, Water and Environmental Science at the University of Arizona in Tucson; in conjunction with the School of Public Health, Loma Linda University in Loma Linda, California. (Gerba, Williams, & Sinclair, 2010) The cross contamination problem can best be described in the following quotation from this study:

“Most foodborne illnesses are believed to originate in food prepared or consumed in the home. Cross contamination of foods during handling is one of the factors leading to this statistic. Cross contamination occurs when disease causing microorganisms are transferred from one food to another. For example raw meat products are often contaminated with foodborne bacteria such as Salmonella and Campylobacter. While cooking these foods usually destroy these bacteria they may be transferred to other foods, which may be consumed uncooked, or contaminate the hands of consumers and be directly transferred to the mouth resulting in infection. Transfer may occur by surfaces such as cutting boards, kitchen counter tops and by the hands. “ (Van Asselt, de Jong, de Jong, & Nauta, 2008)

This study included a sampling of 84 reusable bags. The study included interviews of bags users to determine a profile of bag usage. The following are some of the statistics from the study:

- 49% used the bag once per week; 22%, twice per week; 18%, three times per week; 11% more than three times per week
- 70% used the bag solely for groceries; 30%, for other uses
- 75% did not use separate bags for meats and vegetables; 25%, did
- 55% transported bags in the automobile trunk; 45% in the back seat
- 55% stored bags in the home; 45%, in the automobile
- 97% did not wash bags; 3% did (**Note:** 3% as of 2010, this may be more today.)

The fact that 97% did not wash their bags; that 45% stored bags in the car; that 75% did not use separate bags for meats and vegetables; and that 30% used bags for other uses, are all factors that lead to high bacteria counts and the potential for cross-contamination. The bacteria counts that were identified in this study included the following:

- Most used bags showed some level of bacteria
- 51% of bags had Coliform bacteria
- 12% of bags had Escherichia Coli (E. Coli)

The bags containing Coliform bacteria indicate the bags were contaminated by raw meats or other uncooked food products and the presence of E. Coli indicates fecal contamination. The presence of these bacteria demonstrates that bags **do** become contaminated and that food borne pathogens **do** exist on the bags.

The study showed that no bacteria were found in plastic carryout bags or new reusable bags.

The study also evaluated the potential for bacterial growth when reusable bags were stored in the trunk of car for two hours resulting in a 10-fold increase in bacteria.

The study concludes that *“A potential significant risk of bacterial cross contamination exists from using reusable bags to carry groceries.”* The study further identified that hand or machine washing reduced the quantity of bacteria in reusable bags by more than 99.9%. **The study recommended that reusable bags be washed on a regular basis and that the public be educated on the proper use and care of reusable bags.**

Health Hazards and the ABC News Investigation

While some people question the previous two studies, a [video](#) produced by ABC News Call 7 Investigators collected bags from shoppers and tested the bags for bacteria. The lab results were taken to Dr. Michelle Barron an infectious disease expert at the University of Colorado Hospital. Three bags had relatively low bacteria counts presenting little risk of illness; two, moderate bacteria counts presenting moderate risk of illness; and two, extremely high bacteria counts presenting high risk of illness. Some of the bags also showed high levels of yeast and mold. The investigator also dusted a grocery bag with a substance that glows in the dark to demonstrate how harmful germs can travel, from the bag, to the groceries and hands, to countertop, to the cupboard and refrigerator. Dr. Barron also suggested the bags be washed or sanitized with bleach wipes after each use. She also stated *“We’re trying to be environmental. I fully support that. But not at the cost of your health.”* (Marchetta, 2012)

Health Canada Confirms Health Concerns

The Department of Health in Canada issued an Advisory and Warning titled [“Health Canada Reminds Canadians to Avoid Cross-Contamination When Using Reusable Grocery Bags and Bins”](#). (Health Canada, 2013) The Advisory reminded Canadian citizens and residents to wash their reusable bags and bins to prevent food-related illnesses and provided some guidelines in segregating foods and using your reusable bags in a safe manner. What is important here is that the Canadian Department of Health validated the concerns expressed in the Summerbell study.

CDC Advises Washing Reusable Bags Often

The Centers for Disease Prevention and Control (CDC) posted an article titled [“Reusable Grocery Bags: Keep ‘Em Clean While Going Green”](#) recommended washing reusable bags often and segregating foodstuffs in separate bags, recommendations that are similar to the Loma Linda Study. (Gieraltowski, 2012)

Bacteria Levels in the Home

The Summerbell and Loma Linda studies both documented that bacteria, yeast, mold and coliforms are present in reusable shopping bags. The City of San Jose in their Environmental Impact Report (EIR) (City of San Jose, 2010) minimized the concern for bacteria levels in reusable shopping bags by citing another

study showing that people are exposed to much higher bacteria and coliform levels on surfaces in the home such, as a table top, counter top, and cutting board. However, they miss the point entirely! (Josephson, Rubino, & Pepper, 1997) The issue is not exposure to bacteria; the issue is bacterial contamination of food items that are ingested uncooked and could result in a food borne illness. A better example would have been to compare bacteria and coliform levels on dishes and cookware and cutting boards that have been washed in the dishwasher which kills 99.9% of bacteria. (Williams, 2014) In that case, the bacteria levels in the reusable bag are thousands of times greater.

Australian Microbiologist Craig Andrew-Kabilafkas states: *“With so many toxin producing germs lurking in the kitchen, vigilance is paramount. The best way to safeguard your household from unnecessary bouts of illness is to ensure eating utensils and food preparation tools are kept as bacteria free as possible by washing them at a very high temperature. Only a dishwasher can safely wash dishes at temperatures around or above 68°C which is needed to effectively kill 99% of bacteria.”* (Hunter)

What needs to be kept in mind is that there are various strains of bacteria, some of which are found in your own household and are safe, but other strains can cause severe food poisoning and even death. (Wikipedia)

The Centers for Disease Control (CDC) estimates that each year roughly 1 out of 6 Americans (or 48 million people) get sick, 128,000 are hospitalized, and 3,000 die of foodborne diseases. (Centers for Disease Control and Prevention, 2011)

Increase in Deaths and Emergency Room Visits after Plastic Bag Ban

San Francisco County in California was the first major jurisdiction to enact a ban on plastic bags in 2007. In a report titled *“[Grocery Bag Bans and Foodborne Illness](#)”* the authors discovered that death from foodborne illness increased by 46% or 5.5 deaths after the plastic bag ban for the county was implemented. In addition, the report cites that Emergency Room (ER) visits increased by 34% or 40 visits where E. Coli is the principal diagnosis. Using various statistical methods the authors show that deaths increased between 5.4 to 15.8 and ER visits increased from 40 to 70. These results understate the true total effect because many individuals likely suffer food borne illnesses without going to the hospital or dying. The authors of the report state that similar results are seen in other areas where plastic bags are banned. (Klick & Wright, 2012) The increase in deaths and emergency room visits due to foodborne illness with a plastic bag ban is interesting even though a direct correlation with the use of reusable bags has not been proven or disproven and other factors may be at work.

Lessons from the Oregon Norovirus Incident

In 2010, six members of an Oregon soccer team became ill with acute gastroenteritis during a weekend soccer tournament. (Terry, 2012) A concerned mother contacted Public Health authorities and Oregon Public Health investigators were able to confirm that the norovirus that made the girls ill was transmitted via a reusable shopping bag. (Repp & Keene, 2012) There are two things we learn from this incident:

- Public Health Officials traced the source of the virus outbreak to a reusable bag.
- That the reusable bag can transmit contagious viruses.

The significance of the first point is that without the involvement of public health, the source of the illness or method of transmission would **not** have been identified. Similarly, in the event a family does not wash their reusable bags and become ill with a food related illness, they would place the blame on bad food or the flu. The reusable bag would never be identified as the culprit; hence, incidents of illness related to reusable bag contamination will be **under reported**.

The other significant point we learn from the Norovirus outbreak is that the reusable bag can act as a medium to transmit the virus to others. Researchers determined that members of an Oregon soccer team became ill after touching a contaminated reusable shopping bag. The researchers determined that airborne contamination of fomites (contaminated objects) can lead to subsequent outbreaks. (Repp & Keene, 2012)

With respect to the norovirus outbreak, Dr. Charles Gerba, a professor in the Departments of Soil, Water and Environmental Science at the University of Arizona who conducts research about the transmission of pathogens through the environment, issued the following statement: (Kuntz, 2012)

*"The latest outbreak of norovirus reinforces the research we have conducted about the propensity of reusable grocery bags to act as hosts for dangerous foodborne bacteria and viruses. In reality, **reusable bags are likely at fault much more often than we realize: cases often go unreported and uninvestigated.***

*"The cause of roughly 70 percent of foodborne illness cases, the norovirus spreads very easily and Symptom's include projectile vomiting and severe diarrhea. It can have such sweeping consequences as school and emergency room closures. **This incident should serve as a warning bell: permitting shoppers to bring unwashed reusable bags into grocery and retail stores not only poses a health risk to baggers but also to the next shoppers in the checkout line.**"*

The Norovirus causes about 21 million illnesses, 70,000 hospitalizations, and 800 deaths a year in the United States. (Centers for Disease Control and Prevention) Norovirus is also the most common cause of foodborne-disease outbreaks in the United States. Norovirus can spread quickly in closed places like daycare centers, nursing homes, schools, and cruise ships. Usually, it's transmitted by direct human contact and contaminated surfaces. Leafy greens such as lettuce, fresh fruits, and shellfish are commonly involved in foodborne outbreaks. (Centers for Disease Control and Prevention)

Influenza Transmission via Reusable Bags

Like the Norovirus, the influenza virus can also be spread by fomites. The infected person who has touched their nose or eyes (conjunctiva) with their hands will transfer the virus to their hands and subsequently when touching an object transfer the virus to the object (or fomite). If the object is a reusable shopping bag then the shopping bag will be able to transfer the influenza virus to others. The influenza virus has been known to persist on paper currency for several weeks. (Racaniello, 2009)

In the event of an influenza outbreak, the reusable shopping bag will serve as a carrier for transmission of the virus to others. **A reusable bag coming from a home where one or more persons have influenza may be contaminated with the influenza virus.** Since virus can persist for several weeks, even a person shopping who was recently ill may transmit the virus via the reusable bag to others. ***It may be necessary, to ban the reusable bag during an influenza outbreak, or require people to wash their bags before coming to the store, or require clerks who handle the bags to wear gloves.***

Ebola Transmission via Reusable Bags

Ebola also known as Ebola hemorrhagic fever is a severe and often fatal illness in humans. The virus is initially transmitted to people from wild animals and spreads in the human population through human-to-human transmission. The fatality rate is around 50%. (World Health Organization, 2014) Ebola is spread through direct contact with blood or body fluids of a person who is sick with Ebola and by direct contact with objects that have been contaminated with the virus. (Centers for Disease Control and Prevention, 2014) According the Centers for Disease Control and Prevention (CDC), Ebola on dry surfaces such as doorknobs and countertops can survive for several hours; however, virus in body fluids (such as blood) can survive up to several days at room temperature. (Volokh, 2014) The Ebola virus can survive for several days outside the body. (National Health Service, 2014) In addition, *“The Canadian Health Department states that airborne transmission of Ebola is strongly suspected and the CDC admits that Ebola can be transmitted in situations where there is no physical contact between people, i.e.: via direct airborne inhalation into the lungs or into the eyes, or via contact with airborne fomites which adhere to nearby surfaces.”* (Cherry, 2014)

In the apartment where the Dallas Ebola patient lived, an environmentally hazardous materials cleaning company, cleaned the apartment from ceiling to floor and stripped out the carpet, curtains, and all belongings. (Phase II Decontamination Of Ebola Patient’s Apartment Completed, 2014) When you consider, the extent of the cleanup of the apartment, one should conclude that a reusable bag coming out of a home where a person is sick with Ebola is at risk of being contaminated with the Ebola virus. If so, the reusable bag has the potential to act as a fomite and further transmit the virus to others.

Although only a few well publicized cases have occurred in the United States, shoppers should be aware of and take additional precautions in using reusable shopping bags if an epidemic of a contagious disease such as Ebola occurs in their local community. These additional precautions could include either using sanitary store supplied paper or plastic bags or by washing and sanitizing your reusable bags between each use. Be sure to wash and sanitize surfaces that come in contact with your grocery bags.

Other Disease Transmission via Reusable Bags

Other diseases that are commonly spread by means of fomites (contaminated objects) include the common cold, cold sores, conjunctivitis, coxsackievirus (hand-foot-mouth disease), croup, E. coli infection, Giardia infection, influenza, lice, meningitis, rotavirus diarrhea, Respiratory syncytial virus (RSV), and strep. (Kanchanaraksa, 2008)

Life-Long Consequences of Foodborne Pathogens

The Center for Foodborne Illness Research and Prevention published an article entitled "[The Long-Term Health Outcomes of Selected Foodborne Pathogens](#)" documented **potential life-long complications** from foodborne pathogens:

*"Foodborne disease is a serious public health issue that, according to the Centers for Disease Control and Prevention (CDC) causes tens of millions of acute illnesses, hundreds of thousands of hospitalizations, and thousands of deaths each year in the United States. While the severity of acute foodborne disease varies greatly, depending on the pathogen and the vulnerability of the person infected, **the impact of foodborne illness on children, as well as for the elderly and immune-suppressed (e.g., pregnant women, people undergoing chemotherapy, organ-transplant recipients, HIV/AIDS patients), is more likely to be serious and/or long-lasting.**"*

*"Diarrhea and vomiting are common symptoms, and in most cases, last for only a few days. **However, most foodborne pathogens can cause, in a small percentage of cases, serious acute and/or life-long complications, including: kidney failure; paralysis; seizures; hearing/visual impairments and mental retardation.**" (Roberts, Kowalcyk, & Buck, 2009)*

At Risk Population Groups

To minimize health risks, periodic washing of reusable bags and segregation of food products into separate bags is recommended. Many people, when educated about the importance of washing and sanitizing their reusable shopping bags will maintain their bags in a sanitary condition; however, there are several at risk population groups including immunocompromised individuals and the homeless. Each of these groups presents a unique set of characteristics that that will put them at risk from health hazards associated with reusable shopping bags.

Immunocompromised Individuals at Risk

Individuals who are Immunocompromised are not capable of battling infections because of a weakened immune system. This includes people who have HIV or AIDS, leukemia, lymphoma, undergoing chemotherapy or radiation therapy for cancer, are pregnant or who take immunosuppressive post-transplant medications. (The Free Dictionary) According to the article "[Sensitive populations: who is at the greatest risk?](#)" 20% of the population belongs to this group and who are at greater risk to food and waterborne illnesses than the population at large:

In assessing the potential impact of food and waterborne disease, it is important to recognize that certain individuals may be at greater risk of serious illness than the general population. Individuals who are at increased risk of developing more severe outcomes from microorganisms are the very young, the elderly, pregnant individuals, and the immunocompromised (organ transplants, cancer patients, AIDS patients). This group represents almost 20% of the current population in the United States ... The elderly and the immunocompromised are an ever increasing segment of the population whose numbers are expected to increase in the years ahead. This article presents an assessment of the increased risk for segments of the population

from enteric pathogens which may be either water or food borne. (Gerba, Rose, & Haas, Sensitive populations: who is at the greatest risk?, 1996)

Immunocompromised Individuals would be best served by using sanitary plastic and/or paper bags vice a reusable bag or alternatively washing their reusable bags between uses.

The Homeless and the Public at Risk

A significant number of the homeless live in the street, in their vehicles, or in makeshift housing comprised of tents, crates, and cardboard boxes in encampments located in river bottoms, under freeway overpasses, and empty lots. Living conditions in these encampments can be dangerous to one's health. Garbage attracts rats, mice, and various other rodents. In these encampments food cannot be stored properly, dishes cannot be washed properly thereby facilitating the spread of food-borne diseases. In most cases, there are no public toilet facilities nearby and the homeless defecate and urinate in outdoor locations. (Cousineau, 1993) Poor hygiene contributes to a variety of health problems including heart disease, cancer, liver disease, kidney disease, skin infection, HIV/AIDS, pneumonia, tuberculosis, sexually transmitted diseases, and meningitis. Alcohol and drug addiction are also major problems. (National Coalition for the Homeless, 2009)

Further compounding the environment of homeless encampments are diseases that are transmitted by rats and mice or other rodents that are attracted to the garbage. Diseases include Eosinophilic Meningitis, Rat-Bite fever, Leptospirosis, Hantavirus Pulmonary Syndrome (HPS), Murine Typhus, Salmonella Enterica Serovar Typhimurium, and Bubonic Plague. (Rats In The Attic, 2012)

In addition, riverine environments are also a source of Cholera. Transmission is primarily by the fecal contamination of food and water caused by poor sanitation. This bacterium can, however, live naturally in any environment. (Sack, Sack, & Chaignat, 2006)

If a plastic bag ban is in place, the homeless will gravitate to using reusable bags, because they are more durable and can hold more stuff. Paper bags will not survive long in the riverine environment. The homeless simply do not have the facilities to wash their reusable bags and will be unable to maintain their bags in sanitary condition, putting themselves at further risk for food-borne illness. Their bags when stored in their unsanitary environments would attract rodents looking for food, and potentially contaminating the bags with dangerous viruses, such as the Hantavirus. (Cone & Press, 2012) Then when they take their shopping bags from the unsanitary environment of the homeless encampment to the grocery store, their unsanitary reusable shopping bags constitute a health hazard for store clerks and other shoppers. The same is true for shopping carts used by the homeless, when returned to the store they constitute a health hazard for shoppers. (Chamard, 2010)

Common Sense

All of the studies, in one or more ways, identify the importance of washing or sanitizing reusable bags in order to avoid the risk of foodborne illness and potential lifelong health consequences. Individuals who

are Immunocompromised (20% of population) are at an increased risk from foodborne illness including those who are homeless and not capable of washing or sanitizing their reusable bags.

The problem with foodborne illness due to bacterial contamination of reusable shopping bags is exacerbated by laws that coerce people into using reusable bags against their will and who cannot be expected to expend the energy and be responsible to maintain those bags in a sanitary condition. (Fields, 2014) It is one thing for people who voluntarily use reusable bags and who can be expected to maintain their bags in a sanitary condition; but another, for people who are coerced.

Conclusion

The use of reusable shopping bags introduces bacterial and viral health hazards to the shopper that were not previously encountered with sanitary store-provided paper and plastic bags. Those health hazards can have serious and lifelong consequences if shoppers do not wash and/or sanitize their bags on a regular basis to preclude bacteria buildup and prevent illness from foodborne pathogens and from viral disease transmission. In the event of an epidemic, shoppers should take additional precautions by washing shopping bags more frequently or use sanitary store-provided paper and plastic bags.

In the event that reusable bags cannot be sanitized, sanitary plastic or paper bags should be used instead. In the event that these bags are not available, the shopper should supply their own sanitary plastic or paper bags.

About The Author

Anthony van Leeuwen is the founder of the [Fight The Plastic Bag Ban](http://fighttheplasticbagban.com) website and writes extensively on the subject. He holds a bachelors and master's degree in Electronics Engineering and has over 40 years of experience working for the federal government.

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