

Hands at Oakland University: Are They as Clean as You Think?

Submitted by

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## Part I: Biological Evidence Supporting Hand Washing Importance

According to the Centers for Disease Control, CDC, “Hand washing is critical to help prevent the spread of illness and disease.” There are a few readily identified simple steps involved in properly washing your hands. First, wet hands with warm water and thoroughly scrub the entire hand for about 20 seconds. Next, rinse your hands and dry with a paper towel or air dryer. Do not touch the dirty faucet to turn off the water with your clean hands; instead, use a paper towel. Hands should be meticulously washed before and after a variety of different activities: preparing food, eating food, using the toilet, blowing your nose, coughing, sneezing and touching animals (CDC, 2010).

There are two types of microbial flora that grow on the hands: residential and transient flora. Residential flora is bacteria with a low-pathogenic potential that can't be easily removed when you wash your hands. Transient flora, on the other hand, has high pathogenic potential and is a main cause of infections. *Escherichia coli* and *Pseudomonas aeruginosa* are two common transient flora that are readily removed when hands are washed (Hugonnet & Pittet, 2001).

Proper hand hygiene habits are extremely important after using the toilet or changing a diaper and before preparing food. Infections can be caused by a number of different transient bacteria found in fecal material. A perfect example of how an infection caused by fecal contamination is contracted is going to a restaurant with a cook who doesn't wash his or her hands after using the toilet, and then proceeds to touch the food you ordered in the process of cooking it. *Campylobacter*, *Escherichia*

*coli*, *Shigella*, and *Salmonella* are typical infectious bacteria that cause severe diarrhea with a fecal-oral transmission (CDC Chronic Diarrhea, 2010).

*Campylobacter* are spiral or corkscrew shaped bacteria. Specifically, *Campylobacter jejuni* is one of the main causes of bacterial foodborne illnesses. Campylobacteriosis is an infection that affects the tissues of the jejunum, ileum, and colon, resulting in bloody diarrhea, cramps, fever, and pain. The symptoms last about a week and most infections don't require a special treatment. Physicians recommend drinking extra fluids to prevent dehydration due to loss of fluid through the stool. In chronic cases, antibiotics are prescribed to decrease the length of time symptoms occur. Infection can be caused by coming into contact with feces of an infected human or animal and can be prevented from occurring by washing your hands after going to the bathroom, touching animals, and before preparing and eating food. Infected individuals can prevent spreading the disease to others by properly washing their hands frequently. (CDC *Campylobacter*, 2010).

*Escherichia coli* are an extremely large population of gram-negative bacteria that can thrive on a liberal number of different nutrients. They typically live in the intestines of humans and other animals. Most *E. coli* are harmless, but there are multiple pathogenic strains. *E. coli* can cause infections both inside and outside of the intestinal tract. Some strains cause diarrhea while other strains will cause urinary tract infections, respiratory infections and pneumonia; more types of infection can be caused by different strains as well. Infections, caused by *E. coli* that produces shiga toxin, happen when humans swallow human or animal feces, which unfortunately happens more than

we would like. Symptoms of *E. coli* infections have an incubation period of around three to four days and usually begin slowly with mild stomach pain and diarrhea then get substantially worse before it gets better (about a week after the symptoms began). Hemolytic uremic syndrome (HUS) is a possibly life threatening complication that affects approximately 5-10% of people with *Escherichia coli* infections. In order to avoid permanent damage and/or death, people with HUS should be hospitalized. Greatly decreasing the chances of contracting and transmitting *Escherichia coli* infections is simple with proper hand hygiene. Thoroughly wash your hands after going to the bathroom, after helping a child use the toilet or changing a diaper, before preparing and eating food, and after touching animals (CDC *E. coli*, 2012).

Shigellosis is caused by a family of bacteria, *Shigella*, that is related to *E. coli* and *Salmonella*. *Shigella* causes bloody diarrhea, fever, and stomach cramping in humans. Laboratory tests of stool samples need to be conducted to determine that *Shigella* is the infectious agent as a number of bacteria will cause the same symptoms. Shigellosis will typically resolve itself in about a week, but the appropriate antibiotics can shorten the disease symptoms by a day or two. *Shigella* is detected in the stool up to two weeks after the symptoms of the disease have subsided. The bacteria are transmitted from one person to another by coming into contact with infected diarrheal feces. This is the result of inadequate hand hygiene (CDC Shigellosis, 2010).

*Salmonella*, a genus of rod-shaped bacilli that are gram-negative and part of the Enterobacteriaceae family, causes salmonellosis, an infection that causes diarrhea, fever, and abdominal cramps that last between four and seven days. With

salmonellosis, if the diarrhea is serious enough, hospitalization is required. With persistent infections such as this, it can spread to other parts of the body and potentially cause death if not quickly treated with antibiotics. Salmonellosis can be prevented by hand washing after coming into contact with feces and prior to handling food. People who already have salmonellosis should practice proper hand hygiene techniques after using the toilet and should not prepare food for others until a stool test shows that the bacteria is no longer present in order to prevent transmitting the infection (CDC *Salmonella*, 2010).

Washing your hands after touching an animal is important in the prevention of contracting a zoonosis. A zoonosis is a disease that can be given to humans by direct contact, aerosols (moisture droplets), or bites by animals (Madigan, Martinko, Stahl & Clark, 2012). Types of zoonosis include *Escherichia coli* and *Salmonella* (CDC *Salmonella*, 2010).

Every time you blow your nose, cough, and sneeze, moisture droplets are circulated into the air and onto your hands. The infectious droplets from one sneeze contain anywhere between 10,000 and 100,000 bacteria. *Streptococcus* spp., cold viruses, and influenza can be transmitted by coughing and sneezing into your hands, or blowing your nose near someone and not washing your hands after, as well as on fomites, inanimate objects such as door handles, books, money, and drinking fountains (Madigan, Martinko, Stahl & Clark, 2012). An example would be, you have a cold and you're sitting in the Oakland Center waiting for someone. All of a sudden you sneeze into your hand. Once you see the person you're waiting for, you greet him or her and in

the process touch his or her hand. The two of you then walk to class in another building. During the walk to class you touch more than one door handle. By not washing your hands, you've potentially infected hundreds of people: the people sitting in the area you sneezed, the friend you walked to class with, and all of the people who touch the door handles after you did.

*Streptococcus pyogenes* is a nonsporulating, homofermentative, aerotolerant, anaerobic gram-positive chain of cocci. It is also known as *group A streptococcus* (GAS) and is the cause of streptococcal pharyngitis, better known as "strep throat." The symptoms of "strep throat" include: a severe sore throat, enlarged tonsils, tender cervical lymph nodes, a mild fever, and malaise. A sore throat is caused by *S. pyogenes* about half the time, the rest of the time it's caused by a virus that it spread the same way as the bacteria. With the bacterial infection, it is imperative that it is treated with an antibiotic; otherwise it can lead to serious diseases, such as, scarlet fever and acute glomerulonephritis (Madigan, Martinko, Stahl & Clark, 2012).

The most common infectious diseases, colds, are viral infections spread from person to person via fomites or via droplets from the respiratory system. Thankfully colds don't last long, about a week or less, but there are still undesirable symptoms such as generally not feeling well and nasal inflammation. Colds cannot be cured, but the symptoms can be controlled (Madigan, Martinko, Stahl & Clark, 2012).

Influenza, a RNA virus is another common infectious disease. Symptoms include chills, fatigue, fever, headaches, and body aches. It is transmitted, once again, by coughing and sneezing and then proceeds to infect mucous membranes. The influenza

virus cannot be treated, the symptoms can. Influenza outbreaks are preventable with a vaccine (Madigan, Martinko, Stahl & Clark, 2012). Proper hand hygiene habits also make a difference in decreasing the possibility of contracting the influenza virus (CDC Cover Your Cough, 2010).

## **Part II: An Influential Study of Hand washing Habits on a College Campus**

### **INTRODUCTION**

Hand washing is the “single most effective way to prevent the spread of infections” ([http://www.ccohs.ca/oshanswers/diseases/washing\\_hands.html](http://www.ccohs.ca/oshanswers/diseases/washing_hands.html)). Unfortunately, hand washing is not as common as it could be. It had been reported that less than 60% of people in most communities wash their hands after using the restroom: in fact, one study showed that only 58.3% of college students either washed their hands with soap and water or used sanitizer (Basco, Taylor, Ward, and Zaied, 2010).

Hand washing is a simple task, and yet many people still choose not to do it. My reason for wanting to undertake this research project is that I am concerned that so many people don’t wash their hands, causing germs to spread around a place I spend a lot of time at. I would like to be able to help tackle the issue of preventing infection by pathogenic bacteria at Oakland University.

The primary aim of this research was to affirm my opinion that not enough people wash their hands, and in failing to do so, are instrumental in spreading potentially harmful microorganisms around Oakland University’s campus. This project’s secondary aim is connected with the use of social media in research. The personal goals of my research were to provoke both staff and students into developing better hand washing habits. An argument for this is that if enough people become more

knowledgeable about the negative effects of bad hand hygiene and change their hand washing habits, it should significantly help control the spread of harmful pathogens on and around campus. This paper will assess whether the research I compiled and posted onto a Facebook page impacted hand hygiene habits or not, and it will consider the role of social media in such socially specific research.

## **METHODS**

To achieve the primary aim of this research, I had both students and faculty members fill out two anonymous online surveys about their hand hygiene practices. I used Facebook as the primary recruitment medium for transmission of the survey, along with direct email contact. Most college students, and many faculty members and staff, have a Facebook account at [www.Facebook.com](http://www.Facebook.com), making it a great way to reach a high number of people. The first survey was conducted during the Summer I academic period and consisted of questions based on questions and previous surveys conducted by the Center for Disease Control and Prevention (CDC), the Bradley Corporation, World Health Organization (WHO) and the Cleaning Institute. Questions concerning the participant's knowledge of proper hand hygiene were asked, as well as whether or not he or she has heard of the Infection, Prevention, and Control Committee at Oakland University and its functions.

### Hand Hygiene Survey

1. Male or Female
2. OU Student or other OU community member
3. How often do you wash your hands before eating?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never



4. How often do you wash your hands after using the toilet?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never
5. How often do you wash your hands after blowing your nose, coughing, or sneezing?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never
6. How often do you wash your hands before, during, and after preparing food?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never
7. How often do you wash your hands before and after treating a wound?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never
8. How often do you wash your hands after touching garbage or animals and animal waste?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never
9. How often do you wash your hands before and after caring for a sick person or changing a diaper?
  - a. Always
  - b. Most of the time
  - c. Sometimes
  - d. Usually not
  - e. Never
10. Are you aware that we have an IPC committee on campus and what they do? Yes or No.

After the survey was completed, participants were directed to a Facebook page, titled “When, How, and Why to Wash Your Hands,” that compiles information and statistics on the importance of hand hygiene.

#### **When, How, and Why to Wash Your Hands**

Many people know hand washing is important, but do they really know why?

#### **Why you should wash your hands**

- Hand washing is easy to do and it's one of the most effective ways to prevent the spread of many types of infection and illness in all settings. (1)
- Illnesses spread through hand-to-hand contact include the cold, flu and diarrhea, and neglecting proper hand washing can communicate food-related sicknesses such as salmonella and E. coli. This can be prevented by washing your hands. (2)

- Twenty-five percent of all food-borne illnesses are transferred through hands that are unwashed or improperly washed. (3)
- Money changes hands more than just about anything, allowing an enormous number of germs (pathogenic bacteria) to grow. Do you wash your hands after handling money? You should! (3)
- "The [British Medical Journal](#)" in 2009 published a study which amalgamated 50 other independent studies, and concluded that washing the hands at least 10 times daily is necessary to prevent disease. (4)
- In 2005 the American Society for Microbiology did a survey of hand washing. They asked people questions about their hand-washing habits and also watched people in public restrooms. The results: People don't always wash their hands after using the bathroom — 91% of adults say they always wash their hands after using public restrooms, but just 83% were seen doing so. (5)
- You can have two types of bacteria on your hands, resident flora that's always there and has low pathogenic potential (won't get you sick) and highly pathogenic transient flora that can easily be removed by properly washing your hands. (6)
- Every year, more than 164 million school days are lost due to illness. It is believed that a great number of these days could be reduced if children merely washed their hands properly and regularly. (7)

#### **When to wash your hands (1)**

- Before, during, and after preparing food
- Before eating food
- Before and after caring for someone who is sick
- Before and after treating a cut or wound
- After using the toilet
- After changing diapers or cleaning up a child who has used the toilet
- After blowing your nose, coughing, or sneezing
- After touching an animal or animal waste
- After handling pet food or pet treats
- After touching garbage

#### **How to wash your hands (1)**

- Wet your hands with clean, running water (warm or cold) and apply soap.
- Rub your hands together to make a lather and scrub them well; be sure to scrub the backs of your hands, between your fingers, and under your nails.
- Continue rubbing your hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.
- Rinse your hands well under running water.

Dry your hands using a clean towel or air dry them.

At OU, we have an IPC committee (IPC stands for Infection, Prevention, and Control) that works to educate the Oakland University community about ways to preventing illnesses. There are posters all around campus with important messages from the IPC. For more information go to <http://www.oakland.edu/infectionprevention/>

#### **Sources**

- (1) <http://www.cdc.gov/features/handwashing/>
- (2) [http://www.ehow.com/about\\_5422641\\_hand-washing.html](http://www.ehow.com/about_5422641_hand-washing.html)
- (3) [http://www.ehow.com/facts\\_6172119\\_little-known-handwashing.html](http://www.ehow.com/facts_6172119_little-known-handwashing.html)
- (4) [http://www.ehow.com/facts\\_5617151\\_statistics-handwashing.html](http://www.ehow.com/facts_5617151_statistics-handwashing.html)
- (5) [http://kidshealth.org/teen/your\\_body/skin\\_stuff/handwashing.html#](http://kidshealth.org/teen/your_body/skin_stuff/handwashing.html#)
- (6) <http://onlinelibrary.wiley.com/doi/10.1046/j.1469-0691.2000.00104.x/pdf>
- (7) "Vital Health and Statistics, Current Estimates from the National Health Interview Survey, 1995" (U.S. Centers for Disease Control and Prevention and the National Center for Health Statistics, 1998).

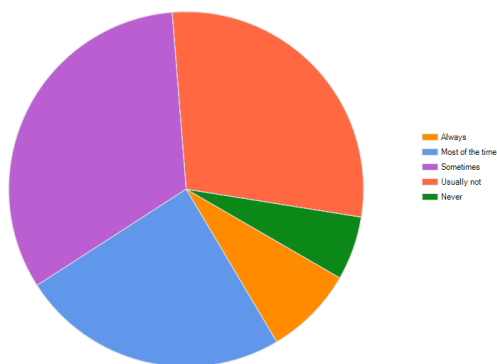
The survey takers were also asked to send me an email if they were willing to take another survey in the near future. The second survey was conducted during the Summer II academic period and was exactly the same as the first survey. I then compared the results from the first and second surveys to determine whether or not hand hygiene habits were influenced.

## **RESULTS**

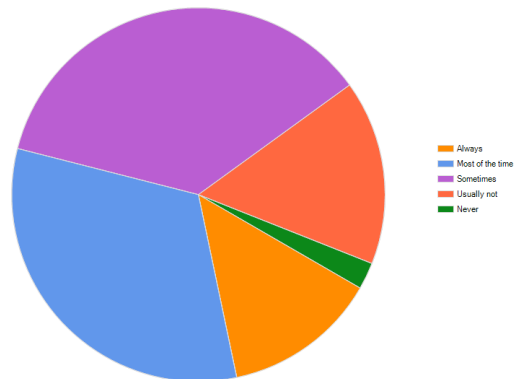
The results from both surveys will be analyzed as a whole, males, females, OU students, OU professors and faculty, male students, female students, male faculty, and female faculty.

There were 344 people who took the first survey. Only 72.3% of the people who took the survey always washed their hands after using the toilet. As is seen in the graph on the left, over 50% of people sometimes or usually don't wash their hands after coughing, sneezing, or blowing their nose; 28 out of 344 people always wash their hands.

How often do you wash your hands after blowing your nose, coughing, or sneezing?

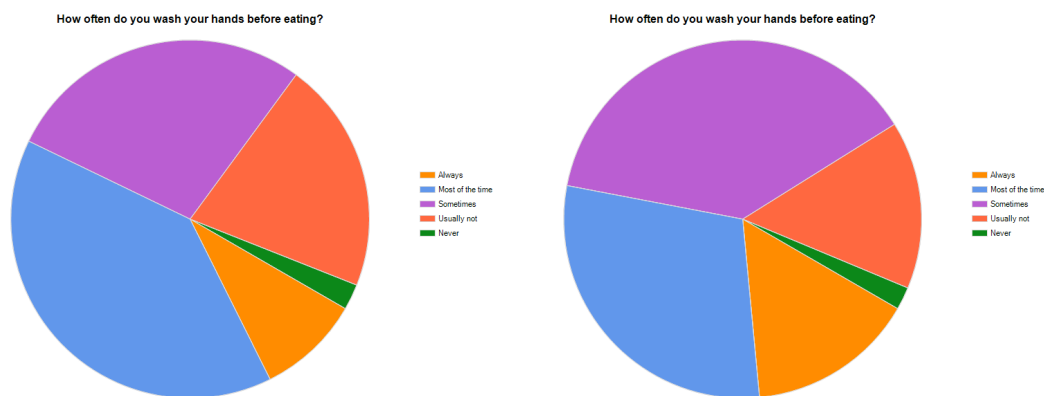


How often do you wash your hands before eating?



The above right pie graph shows the hand washing habits of people before eating. The majority, 124 people (36%) sometimes wash their hands. Only 13.4% always washed their hands. When asked about their hand washing habits before and after treating a wound, 45.9% said they always washed their hands. 95.1% of the survey takers were not aware that there is an Infection, Prevention, and Control committee on Oakland University's campus and do not know what they do.

When the results from the first survey were broken down into males (89) versus females (255), it showed that the only major difference in response was when asked about hand washing before eating. The male majority, 38.2%, washed their hands "most of the time" while the female majority, 38.4%, washed their hand "sometimes" before eating. The chart on the left is male responses and the chart on the right is female responses. Notice that the blue wedges represent the number of people who said they wash their hands "most of the time" and the purple wedges represent the number of people who said they wash their hands "sometimes."



Student versus faculty responses were comparable and coincide with the overall responses. More male students, once again, washed their hands "most of the time"

before eating while more female students washed their hands “sometimes.” Faculty responses were limited, but over all female faculty members had better hand washing habits than male faculty members.

While the results of the second survey are inconclusive due to the lack of responses (21 total responses) they show a general increase in most categories. Especially when washing hands before eating: the majority response was now “most of the time.” The majority of the people taking the survey still responded that they didn’t know about the IPC committee at Oakland.

## **DISCUSSION**

Even though there weren’t enough results from the second survey for an accurate comparison, the first survey failed to reject my hypothesis that not enough people wash their hands. It was unexpected that males would say they washed their hands before eating more than females did. Stereotypically, females have better hand hygiene than males. Everyone that took the survey has at least some higher education, leading to the assumption that they would know to wash their hands before and after treating a wound to protect both themselves and the wounded person. However, less than 50% of the people said they always wash their hands before and after treating a wound. I also expected people to wash their hands more after coughing, sneezing, and blowing their nose. It has been engrained in the mind since childhood to wash your hands so you don’t get sick or get others sick, yet the majority of people only sometimes wash their hands after coughing and sneezing.

My research showed that college students at Oakland University washed their hands after going to the bathroom more than Basco, Taylor, Ward, and Zaid's research showed in 2010. Their study showed that only 58.3% of college students washed their hands after going to the bathroom, while my data suggests that 73.3% of students wash their hands.

With many people having some sort of social media account, namely Facebook, it seemed like a good way to reach a large audience. However, this research tells me that using Facebook is not the best way to get a message across when it's a scientific topic. On Facebook, most people don't pay much attention to things that don't stand out and demand attention, myself included. Unfortunately, proper hand hygiene is not an attention grabbing subject. Someone needs to devise a better way, besides using Facebook and putting posters on bathroom walls, to stress the importance of hand washing in order to decrease illness and disease to people on college campuses. The IPC committee should also find a way to better promote itself, as a large majority of people who took my survey had no idea what they were or what they did. The committee has information to be shared that will be beneficial to anyone spending time on Oakland University's campus.

In the grand scheme of things, this research aimed to impact enough Oakland University community members hand hygiene habits for the better in order to decrease the transmission of pathogenic bacteria around campus and to decrease missed classes due to illness.

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