

# Task in Hand

A close up on hand-washing reveals its effects on all facets of life from health and economics to religion and politics

BY TONY POETZ



Young girls from the village of Tongo in Ghana wash their hands before preparing the day's meal. To control the spread of disease, hand-washing is being increasingly promoted in many areas of the world – including those where water is a valued commodity.

AS THE DUST SETTLED, the crowd's tension rose around the victim. The startling interruption of a gun shot still hung in the air as a madman ranted and a president lay dying. Snubbed ambassadorial candidate Charles Guiteau shot President James Garfield twice with a Bulldog .44 on the morning of July 2, 1881. Both bullets found their target. One grazed Garfield's arm, the other lodged deep behind his left lung near his spine. As the would-be assassin was being muscled to the ground just a few feet away, the victim faded in and out of consciousness lying in the lap of the



**A depiction of President Garfield's assassination doesn't reveal the shooter, but does show the killer – his doctor. The physician's dirty fingers left trace amounts of horse manure in the bullet wounds eventually contributing to the president's death.**

man who would ultimately kill him – his doctor.

Condemning Dr. Doctor (his parents ambitiously named him *Doctor*) Willard Bliss for the death of the 20<sup>th</sup> US President may be unfair. After all, he didn't fire the bullets.

Nevertheless, placing part of the blame for the patient's death in the doctor's (and his

team's) hands is accurate. Most historians and medical experts now believe that Garfield probably would have survived his wounds had Bliss and his team been more hygienic –

or at least, less contaminated. Several inserted their un-sterilized fingers (trace amounts of horse manure were found along the bullet's tunnel) and instruments into the wound to probe for the bullet. President Garfield died 80 days later of a massive heart attack, following blood poisoning caused by *Streptococcus* bacteria introduced into his body by his physician – a scenario that could have been avoided if the doctors had only washed their hands. Because of the high ranking status of the victim, a poor hand-washing regimen was responsible for dramatically changing the world.

Hand washing as a part of medical practice was not new at the time of Garfield's death. As early as 1843, renowned physician and author Oliver Wendell Holmes, Sr. argued for the benefits of hand washing in the prevention of Puerperal (or "childbed") Fever. In 1847, Ignaz Semmelweis in Austria began using chlorine compounds for hand-washing after noticing a much lower mortality rate at a midwife's delivery clinic that incorporated the chemicals. In 1867, after seeing the benefits of carbolic acid (also known as *Phenol* –an ingredient in aspirin, but also used as a lethal injection into prisoners at Auschwitz during WWII) as a sewage deodorizer, Britain's Dr. Joseph Lister successfully demonstrated the use of carbolic acid as an antiseptic, finally getting the attention of medical practitioners world-wide. (Dr. Lister's notoriety also grew eventually lending his namesake to Listerine mouthwash.) Dr. Lister's application utilized a spray pump that rendered the caustic acid airborne for all in the operating theater to breathe. Unfortunately for President Garfield, much of the American medical

community was not yet convinced of these methods and was unwilling to allow 'foreign' practice into a community with no shortage of hubris. (After an autopsy on Garfield's remains revealed the extent of the infection and physical damage caused by the team's treatment, the doctors still submitted a bill of \$18,500 to the Office of the President.)



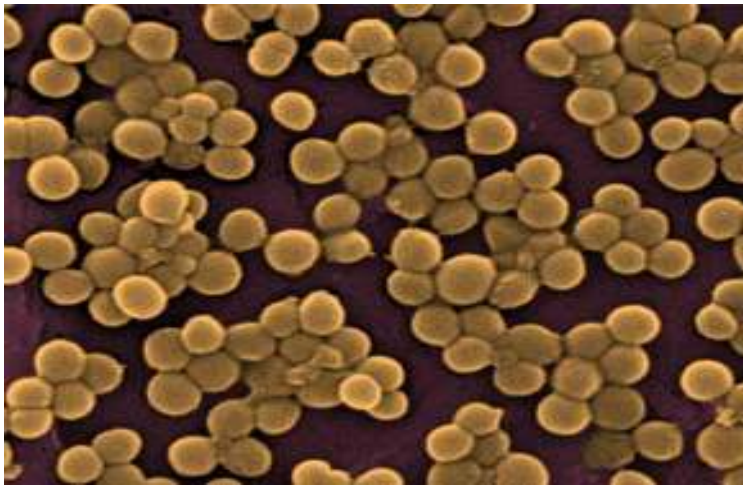
**Dr. Oliver Wendell Holmes, Sr. advocated strongly for proper hygiene in a health-care environment. At one point, he unpopularly recommended that an obstetrician finding two cases of "childbed fever" in his practice within a short time should remove himself from duty for a month.**

With the help of Lister, Holmes and Semmelweis, hand-washing gradually became accepted as one of the most important measures available for preventing pathogen transfer in health-care environments. "With the possible exception of immunization," says Ralph Codell, an epidemiologist at the U.S. Centers for Disease Control and Prevention, "hand washing is the most effective disease-preventing measure anyone can practice."

Government health services have been issuing hand-washing recommendations since the late 19<sup>th</sup> century with the U.S. Public Health Service issuing its first training film in 1961. The film repeated previous advice that health-care workers (HCWs) should wash their hands with soap and water for 1 – 2 minutes before and after patient contact.

Recommendations to the general public are less stringent, ranging in the 20 – 30 second range – or as more and more hygienists recommend – wash as long as it would take to sing “Twinkle, Twinkle, Little Star”.

The advice hasn’t changed much since the origins of hand washing advocacy



**Discovered by a Scottish surgeon in 1880, the most common bacterial strain on your hand is known as *staphylococcus aureus* – latin for ‘golden grape berry’. The average human hand contains anywhere from 5 to 200 million bacterium – 95% of which are hiding under fingernails. Each year about 500,000 hospital patients are stricken with *extra* ailments such as pneumonia, meningitis and toxic shock syndrome after receiving *S. aureus* from unwashed health-care worker hands.**

and neither has the soap. Today’s detergents and chemicals still do the same things – they destroy bacteria. What is evolving is the convenience of improved hand hygiene. Hand sanitizers

are becoming omni-present from bottled solutions that claim 99% bacterial elimination to wet wipes next to the napkins at your restaurant table.

However, dermatologists caution against frequent sanitizer use because its alcohol base strips the skin of its outer layer of oil that normally prevents the body’s resident bacteria from surfacing.

Antimicrobial soap is also widely used, but its overuse is admonished due to the effects on the body’s bacterial stasis.

According to researchers reporting in a recent issue of *Clinical Infectious Diseases*, washing hands with an antibacterial soap was no more effective at reducing bacterial levels or preventing illness than washing with ordinary soap.

Furthermore, the soaps – most of which contain the antimicrobial *triclosan* – produced antibiotic cross-resistance among different species of bacteria; the bacteria evolved into super-bacteria. While there are some strains of super-bacteria that appear to have acquired a reduced vulnerability to antiseptics, they are rare and – other than the expanded nuisance of their expanded life-span – do not pose any more of a threat than regular bacteria. Still, experts note that the use of hand sanitizer is much better than doing nothing at all. In some places, it is the only defense available. Health-care and goodwill organizations are

introducing hand sanitizers to third world countries where the elevated value of clean water can negate the practice of hand hygiene.

Another aspect of hand-washing that is changing is the drying portion. Since 1948, electric hand dryers have been replacing paper towels in many public restrooms. The towel-free units do not require re-stocking. The electricity needed for the compressor is around 10% of the paper towel cost and it's much more environmentally-friendly than disposable towels. According to *American School and University* – a facility management publication – “an average fast-food restaurant using paper

the first place.” Models such as the Dyson Airblade and Mitsubishi Jet Towel utilize 200-400 mph air shot through an iodine filter eliminating the restroom's airborne bacteria. Plus, because of the increased air pressure resulting in a decreased running time, these manufacturers claim an 80% energy savings over traditional hand dryers.

All of these applications ultimately aim toward the elimination of harmful



**Like armored hogs at the trough, skin mites line up to feed on dead skin. A poor hand-washing regimen creates a feast for *Dermatophagoides farinae* as well as a population boom. One square yard of carpet can contain 100,000 mites feeding on dead skin; a mattress – 10 million.**

towels, annually, results in 9 fully-grown trees being cut down, and 1,000 pounds of landfill waste created (paper towels alone amount to 35% of landfill space currently used).” Yet, despite an impressive list of advantages, traditional hand dryers fall short of actual hand cleaning. Corporate engineers at companies known for innovative use of high-speed air as a cleaning application say “the standard-issue dryers just suck up filthy air from the bathroom, heat it, and shoot it out at your hands in even filthier condition, which totally defeats the purpose of cleaning your hands in

bacteria – the most familiar to the skin being in the staphylococcal family. Though there are several different strains of staphylococcal bacteria, the most common of these is *staphylococcus aureus*. Through the lens of a microscope, *S. aureus* resembles a cluster of grapes (in Greek, staphylococcus means “grape berry”.) The skin naturally contains strains of bacteria that are beneficial such as staphylococcus epidermis that actually “gang up” on invading bad guys like Escherichia coli and Salmonella. The delicate mission of soap and hand

sanitizers is to kill the right strains while leaving the skin's beneficial environment intact. Overdoing it can exacerbate the problem as some hospitals have found with nursing staffs becoming more susceptible to infection because they over-wash, destroying their skin's armor in the process.

Along with the most common of these microorganisms making up the skin's flora, there are thousands of different species living on your skin at any given time. One NYU Medical School study took skin samples from six volunteers and found 1,221 signatures of non-human DNA. Of these, they "identified 182 distinct species, some of which are new to science," said study leader Dr. Martin J. Blaser. "Eight to ten months later we retested four subjects and found 65 additional species." Dr. Blaser's samples were not taken over a body's entire area either – the sample sizes were microscopic. An experiment performed by a Johns Hopkins physician in the 1930s gives us an overall sense of just how many critters are crawling around on our hands. After using 14 sterile wash basins, sterile water and the use of regular hand soap for exactly one minute in each basin, the physician found 4.6 million bacteria still clinging to his hand. More recent studies have shown that – along with bacteria – the organism population on a single hand can climb to 200 million including fungi, viruses and microscopic mites feeding on dead skin.

While the number of creepy-crawlies on your hand may be unnerving, statistics related to hand-washing can be downright scary. An Australian study had doctors self-reporting their hand-washing rate at 73% (if they faced 100 patients during the day, they claimed

#### **FIVE THINGS YOU DIDN'T KNOW ABOUT HAND WASHING**

**Monks of the Jain Dharma (a religious sect in India) do not wash their bodies except for their hands and feet. They believe bathing takes the lives of millions of microorganisms**

**From the 17<sup>th</sup>-19<sup>th</sup> century, nearly 25% of women giving birth in a hospital died of Puerperal Fever (aka childbed fever) caused by unhygienic nurses and doctors**

**Oliver Wendell Holmes Sr.'s hand-washing campaign of 1843 was ridiculed by an arrogant medical community. One obstetrician responded by saying "Doctors are gentlemen and gentlemen's hands are clean"**

**TV remotes in hospitals are the worst carriers of bacteria in the building – even worse than the toilet handles**

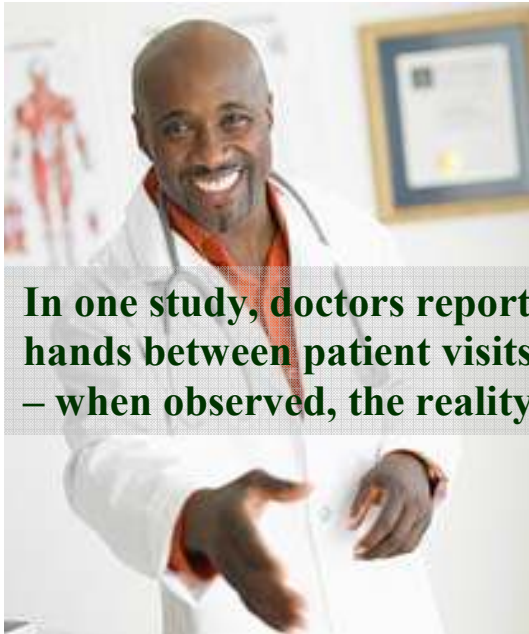
**Because currency travels through thousands of hands, it is one of the most common carriers of bacteria**

hand-washing between visits 73 times) – when observed their actual rate was a measly 9%.

Hospital error results in approximately 98,000 deaths per year in the U.S. with the leading cause found to be bacterial infections. In one study, the rings on the hands of nurses were examined. Massive amounts of bacteria (some considered highly toxic) were found inside 40% of the rings tested. Some of the bacteria had been living under the rings for several

months. In a more general experiment, researchers staked out the restrooms in some of America's busiest venues like New York's Grand Central Station and Atlanta's Turner Field. The study found that 88% of women and 66% of men washed their hands after using a public restroom – a 6% drop since 2005.

To combat the effects brought on by poor hand-washing hygiene, hospitals, businesses and schools are becoming proactive with their approaches. U.S. companies lose approximately \$40 billion per year with 1 million workers calling in sick per day – the number one cause of the sickness being viral. Some corporations post reminders in restrooms that highlight the benefits of hand-



**In one study, doctors reported washing their hands between patient visits 73% of the time – when observed, the reality was 9%.**

washing and the drawbacks of neglect. Restroom signs reading “All Employees Must Wash Hands before Returning to Work” have become ubiquitous in restaurant and convenience store restrooms. Schools show hand-washing videos to students and schedule periodic hand-washing during class.

With studies like the one in Australia revealing 9% hand-washing among doctors and random skin cultures revealing “gobs of colonies of bacteria” on the palms of employees, hospitals have become increasingly direct with their methods. Cedars-Sinai Medical Center in Los Angeles created a Hand Hygiene Safety Posse that roams wards trying to “catch” doctors and nurses washing up, rewarding them with \$10 gift certificates to Starbucks and free bottles of Purell hand sanitizer. With incentives like these, hand-washing compliance has risen from 65% to 80% among the hospital's HCWs.

Compliance is on the rise and not just because of bribery or that hand-washing is hygienically responsible or the fact that bacteria is the cause of body odor. As the information age places all manner of medical knowledge a few keystrokes away (By the way, your keyboard has hundreds of times more bacteria per square inch than a toilet seat), society becomes increasingly paranoid about bacterial transfer. As statistics about dirty hands become

common knowledge, people not only demand more vigilance from their doctor, but also the rest of society. Office workers know who's not washing their hands after restroom use, according to a survey conducted by The American Society for Microbiology. Society also pays close attention to famous people who don't wash their hands after restroom use. A New York Post article reported Presidential candidate John McCain recently exiting an East Hampton airport restroom without washing his hands. While this account

may not have the same political impact as the premature loss of President Garfield, it does become part of the voting public's mental list of pros and cons. With elections coming down to the wire and hinging on characteristics such as saxophone aptitude and hairstyle, the thought of urine on the hands of a candidate may have voters checking a different box on the ballot. Plus, when people think of campaigning, they think of baby-kissing and hand-shaking – two things that probably shouldn't combine with senatorial restroom germs. Ironically, Senator McCain announced his bid for the '08 presidency on the

“Late Show with David Letterman” where the host (concerned with germs and their effect on his weakened immune system following heart surgery) is near phobic about hand-washing and frequently uses hand sanitizer. Not wanting to offend his high-profile guests, Dave keeps the bottle hidden in a drawer – the custom made label on the front reads “moisturizer.”

Though hand-washing may be an important factor where hygiene, politics and public opinion are concerned, some consider it fundamental in terms of their soul's salvation. For thousands of years,



Islamic Kurds in Iraq wash their hands before attending Friday prayer in Suleimaniya. In an area where water is sometimes scarce, efforts to establish the use of hand-sanitizers (which contain ethyl alcohol) still come up short – Muslims are forbidden the use of alcohol.

religious ceremonies have equated bodily purity with moral purity. In what some researchers call the “Macbeth effect” – a threat to one's moral purity induces the need to cleanse oneself – the faithful believe they are truly washing away their sins. Christians, Mandaeanists and Sikhs perform water purification through baptism. Wudu (translated as “ablution” – washing of the hands), is central to Islam. Muslims prepare for worship by first washing their hands followed by other body parts. Hinduism follows similar customs.

Morality outside of the sacred is also affected by the act of hand-washing.

In a 2006 study at the University of Toronto, researchers asked participants to perform tasks such as cheating on tests (in a controlled environment) and

retelling of an unethical deed. In order to affirm an “adequate” amount of distress, the researchers surveyed the emotional states of the participants. After these actions, ½ of the participants were instructed to wash their hands. The researchers then asked if the participants would volunteer for another study that would benefit a desperate graduate student. Searching for a correlation between physical and moral purity, researchers found 74% of the unwashed volunteering to help, whereas only 41% of the clean hands were raised. The unwashed were still in need of an immorality purge.

At a point where our hands are bombarded with bottles of sanitizer, pictures of scary bugs and Starbucks’s gift cards so that we may scrub the critters off, there are some people who can’t stop. One of the most common symptoms of obsessive-compulsive disorder (OCD) is an extreme preoccupation with dirt and contamination. Sufferers of OCD repeatedly wash their hands, often more than 100 times per day resulting in rawness, chapping and, sometimes completely rubbed-off skin. While the origin of OCD (and its related severity of hand-washing) is unknown, doctors currently find that the application of behavioral drugs like Prozac, Paxil and

Zoloft curb the neuro-stimuli believed to be the root.



**Ultraviolet light reveals what is removed and what remains after a thorough hand wash. One human carries 100 trillion pieces of bacteria forcing scientists to combine modern technique with traditional common sense on an ever-shrinking planet.**

As population growth and modern movement bring Earth’s inhabitants closer to one another, the need for a responsible approach to hand-washing will grow increasingly important. Like so many benign acts that become taken for granted, improper practice of this simple action can result in extraordinary circumstances – jeopardizing the world’s health, its commerce, even its faith – and most importantly its future. President Garfield probably would have agreed.