SELLING CLEAN

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It's rumored that former President Bush, before leaving office, recommended Obama use hand sanitizer as a cold preventative. It seems like a sound suggestion: the President shakes approximately sixty-five thousand hands year, exposing himself to a plethora of germs.[1] Yet, Obama is not the only one at risk. Think about everything you've touched today: your computer, phone, a door handle, a shoelace—all of these objects have millions of microbes that accumulate onto your hands. This icky information might tempt you to also follow President Bush's advice, but he has a history of making broad claims that require more research. In fact, the antimicrobial gels are harmful and are not any more effective than regular soap and water.[2] This begs the question, why is hand sanitizer everywhere, including the White House?

The story begins in Bakersfield, California, a city about 100 miles north of Los Angeles famous for gas, agriculture, and country music. It was there, during the sweltering heat of 1966, where nurse Lupe Hernandez made a discovery: alcohol delivered via gel could clean hands in the absence of soap and water. Alcohol's disinfectant properties have been used for centuries: the Egyptians used it to clean bodies before mummification and doctors during the 19th and 20th century used it as disinfectant. Hernandez's brilliance was the delivery in gel form, making it more effective and easier to use. Stricken by her idea's commercial potential, she called an inventions hotline and began a patent project.[3]

At first, Hernandez's discovery only affected hospitals. In the 1970s, surgeons used antimicrobial scrub to sterilize themselves because it prevented patients from bacterial infections during their procedures. Over time, antibacterial use permeated all regions of the hospital. While useful, the soaps in the 70s were problematic: they were either very greasy or they turned doctors' hands ghost white as if doused in rubbing alcohol, causing skin problems.

In 1988, a family-owned hand soap company, Gojo Industries, developed a new gel-based hand cleaner that protected the skin. Despite its benefits, the company lost money on their product for over a decade. According to Joe Kanfer, the CEO, "it drove the sales guys crazy. They couldn't sell the stuff."[4] The product was called Purell. Sales still stalled despite an endorsement in the mid-90s from Wegmans, a New York supermarket chain who installed Purell dispensers in

every store. Gojo Industries needed a market jolt. The SARS epidemic was happy to provide.

SARS was just the beginning of what would become a decade of public health scares. Bird flu, swine flu, and other epidemics have instilled a deep, almost visceral fear of germs. Companies have capitalized on this antimicrobial anxiety, and have spent millions of dollars driving up the demand for their product by further socializing us to be germaphobes. For example, in 2008, Purell launched a campaign called "What You Touch." The ad featured four different hands constructed of a number of images representing different things people touch on a daily basis. One hand is cut into separate sections as if it were a state divided into electoral districts. Everyday objects like laptops, pencils, hammers, and phones each had their own zone. The second hand is divided in the same fashion, but replaces objects with cartoon drawings of various microbes. The third hand features short snippets explaining what dangerous bacteria consumers can pick up from a variety of "everyday objects." The fourth and final hand is free from text, cartoon germs, and objects. It simply coated with Purell as if it were a clear glove protecting it from the world's dangers.

Ads like these have proliferated since the 2000s, and most use rhetoric that plays on the fear and the subsequent need for security that is hardwired into our human psyche. Capitalizing on these two aspects of human nature is risky, and it can have significant consequences. For example, 9/11 generated widespread fear and insecurity in the American public, and much of the rhetoric that drew on these feelings, in part, led to many people demonizing an entire religion, rather than the select extremists who were responsible. In addition, these feelings clouded our collective ability to think critically as a society, which when combined with misinformation, facilitated rash actions – like the invasion of Iraq.

The rhetoric used to describe bacteria produces the same fear-induced phenomena with bacteria. We treat them like tiny terrorists: they are deadly, irrational, and unpredictable. The 2014 Ebola epidemic outbreak illustrates this point perfectly: the U.S. public became hysterical after Thomas Duncan became infected; Ebola headlines dwarfed equally pressing news like ISIS and the crisis in Ukraine, for instance. In an effort to "protect the American people," we have demonized all microbes. (We've all seen the signs on antimicrobial soaps that say "kills 99.99% of all bacteria".) In fact, over ninety percent of bacteria in the world are either harmless, or beneficial. Bacteria help us process our food, regulate our blood pressure, degrade deadly toxins, and the list goes on. Recent studies have also elucidated how the presence (or absence) of certain stomach bacteria can prevent obesity, heart conditions, and other chronic diseases.

Despite these facts, our fear has turned bacteria and its microbial friends into public health enemy number one. Companies like Purell have catalyzed this socialization, driving us into the arms of their products without critically evaluating their safety and efficacy. And it worked: Purell's market research showed one in five people had a hand sanitizer product less than 2 feet away at the time of their questioning.[5]

What most people do not realize is that not all hand sanitizers are safe. There are two classes of products:

one is purely alcohol-based and the other contains either triclosan (TCS) or triclocarban (TCC), two chemicals that have been shown to be harmful to humans. The chemicals in the latter class allow companies to label their products as "antimicrobial." It is a successful marketing gimmick, and now TCC and TCS are everywhere: soaps, detergents, carpets, clothing, toys, paint, and even pacifiers all have antimicrobial properties, and are labeled as such. There are now over 2000 antimicrobial products in the U.S. market alone that generate annual profit margins exceeding 1.4 billion dollars. TCC and TCS are most prevalent in two specific products: antimicrobial soaps and gels. According to Rolf Halden, Founding Director of the Center for Environmental Security and cofounding member of the Center for Water and Health at John's Hopkins University, over ninety-three percent of liquid soaps commercially available contain TCC or TCS.[6]

Scientists can now detect the presence of these chemicals in our body due to overexposure. Halden discovered these chemicals in over ninety-seven percent of women's breast milk while the CDC estimates they are present in the urine of seventy-five percent of the U.S. population. Theoretically, we should know what is floating around in our bodies, or what mothers are transmitting to their children. The unfortunate reality is that we are often uninformed consumers.

My dear friend Kelly exemplifies this insidious consumerism. Kelly is by far one of the smartest people I know: she graduated college Summa Cum Laude and Phi Beta Kappa, and is a medical student.[7] One day, we were venting about people's proclivity to avoid handwashing after using the bathroom, especially among the male population (fun fact, 50 percent of men do not use soap; 78 percent of women do). Kelly ended the conversation by whipping out a small bottle of red pomegranate-mango scented hand sanitizer, proclaiming it was her "solution to the world's filth."

As she squirted a blob out onto her hand, I noticed the active ingredient was "triclosan...0.5%." The hand sanitizer flaunted its antimicrobial prowess, claiming it is "long-lasting clean" because it kills "99.9% of germs." Concerned about her exposure, I asked Kelly if she knew what was in her gel. She nonchalantly shrugged.

"What does it matter? They kill dangerous microbes and that keeps me healthy."

It does matter because antimicrobial compounds like TCC and TCS are double-edged swords. While they kill 99.9% of bacteria, the 0.1% that survives can become resistant and proliferate. This creates a horde of super-bugs that are harder to kill and more pathogenic. Furthermore, TCC and TCS (and pure-alcohol based sanitizers like Purell) have shown to facilitate allergy sensitization because they are not selective – they remove both good and bad bacteria. Beneficent bacteria often process allergens and their absence can cause adverse reactions to our environment. It comes as no surprise the U.S. has the highest prevalence of allergies in the world.

Allergies and super-bugs are not the only health concerns surrounding TCC and TCS. The two compounds are also endocrine disrupters, or compounds that alter hormone levels in our body. For example, TCC and TCS mimic estrogen by binding to their re-

ceptors, causing the body to respond as if it had an excess of estrogen. Scientists do not fully understand the impact of estrogen mimics, but they include the creation and spread of breast cancer, over development of female sex organs, and the feminization of men. An excess of TCC and TCS can also blocks thyroid hormones uptake, which regulates our physiological metabolism. Recent studies also show these chemicals cause liver cancer. The endocrinal effects can have devastating consequences for our bodies.[9]

The scope of damage extends beyond humans. James Forester, an environmental sociologist, once wrote that nature, now more than ever before in history, is shaped by humans. TCC and TCS prove his theory. Over 95% of TCC and TCS are disposed of through bathrooms, kitchens, and other residential drains and consequently contaminate our water. A recent study conducted by the Environmental Protection Agency (EPA) found detectible levels of triclosan and triclocarban in over one-third of the U.S. public water facilities.[10,11]

These compounds, when dissolved in water and exposed to sunlight, are converted into a class of highly toxic chemicals called dioxins. According to the World Health Organization 2010 fact sheet, dioxins cause "reproductive and developmental problems, damage the immune system, interfere with hormones, and also cause cancer."[12] This matters because ninety percent of human exposure to dioxins is through fish, shellfish, meat, and dairy. Contaminated water infects fish, crops, cows, chickens, and pretty much anything that consumes or lives in water. Yet the damage does not stop with dioxins. Most public water systems contain chlorine, which combines with TCS and TCC to form chloroform, another carcinogenic.

Unfortunately, the TCChain reaction continues as we expand our ecological viewpoint. Swaths of scientists are finding massive levels of TCC and TCS in plants and algae. Dr. Halden, the aforementioned scientist at Johns Hopkins, shows that TCC and TCS are "100-1,000 times more effective at killing fish and algae than they are killing bacteria."[13] Dumping these chemicals as waste products into our water systems can disrupt the food chain and cause unpredictable damage to our ecosystems.

This shocking information leads us to ask a simple question: why are these compounds still commercially available, especially given the fact that soap and water are more effective? How is it that Kelly, a college educated woman, or the former President do not know what they are putting into their body? What about people less privileged than Kelly and former President Bush? Is the systemic fear-mongering truly this pervasive and oppressive?

A glib economist would retort it is basic supply and demand. I call it predatory market economics. It is wrong to supply a product that harms people when viable, healthy alternatives exist. The unregulated supply and demand capitalizes on the uninformed like Kelly. I just stumbled upon this knowledge because of a college biology class I took in college that had one goal: to transform us into scientifically-literate consumer activists. I am in the minority. Fortunately for the majority, there are federal agencies like the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) who have the power to ban these

chemicals from the market. Yet, the sheer volume and use of antimicrobial products in stores, hospitals, and schools suggests that these regulatory agencies are not up to snuff.

The FDA is the arm of the U.S. Department of Health and Human Services that ensures drugs, vaccines, and other medical products are safe and effective for humans and animals. They have the regulatory power to stop companies from incorporating TCC and TCS into their products by deeming them unsafe, but how they determine safety is crucial. They begin by selecting a series of scientific studies published about the product. Then, they apparently sift through all scientific studies with a fine-tooth comb. If the study seems sound, they will approve the product.

Their process seems logical, but any scientist will tell you that how research is conducted matters. It is easy to skew studies to yield positive results. Academics circumvent this problem by having others peer-review their work in published journals. This process establishes a degree of trust. Corporations, however, are not required to submit their work in peer reviewed journals and are notorious for conducting flawed research. If the FDA bases their decisions on methodologically flawed studies, it will subsequently create unsound policies that allow innocent people to suffer. Thus, the question is: which studies does the FDA choose and why?

A brief history on FDA policy surrounding TCC and TCS might reveal the answer. Federal regulators first examined the compounds in the 1970s and first sought regulations in 1978. However, very little was actually achieved. The New York Times argues this was because of the "agency's slowness" and "industry lobbying." In other words, the FDA risked the health of U.S citizens either because they were lazy or accepted bribes from profit-motivated businesses. It is absurd to think that an agency whose sole purpose is to protect the health of people will shamelessly neglect its core functions for either money or a 32 year-long break. Lobbyists are the primary cause of the FDA's sluggishness. They acquire political support by donating large sums of money directly to political campaigns, or indirectly through political action committees. If oil conglomerates, pharmaceutical companies, and other corporations control Washington through these means, it is reasonable to expect the 1.4 billion dollar antimicrobial industry to do the same.

It's easy to get frustrated, but recent events gives us hope. In 2010, The Natural Resource Defense Council sued the FDA and forced the agency to make a final decision about TCC and TCS by 2016. Recently, the FDA admitted the chemicals might adversely impact health through antibacterial resistance and endocrine disruption. In December 2013, the FDA finally took action: they gave antimicrobial companies one year to submit data proving TCC and TCS do not harm humans. Even though this is a positive step, this demand should have been made thirty years ago before the chemicals were released commercially. The organization's fundamental purpose is to ensure human safety. The EPA is also to blame when considering the damaged caused by environmental feedback loops. These chemicals harm humans either directly or via the environment. This is a fact confirmed by the scientific community, so why does it need until 2016 to make a

decision? Even worse, why does it take a lawsuit for the FDA (and EPA) to act? It is not only absurd, but it undermines the credibility of these regulatory agencies. Fortunately, some frustrated states like Minnesota and Iowa have sidestepped federal regulatory bodies and banned the chemicals in their state.

FDA supporters argue that their response to TCC and TCS is an anomaly, but that simply isn't true. I have a one-litre blue Nalgene bottle that has a giant green "BPA FREE" sticker. Almost all plastic water bottles now sport similar stickers, but this is a recent phenomena. BPA used to be in almost all plastics and was a goldmine for chemical distributors. In 1997, a movement began to eliminate the substance from the market after scientists suggested BPA was an endocrine disruptor. By 2007, there was definitive proof that BPA greatly damaged human health, but there is still controversy today within the FDA whether or not to ban the chemical. TCC, TCS, and BPA are three of hundreds of dangerous compounds that the FDA refuses to ban.

I once went to a lecture about the benefits of chocolate, and there the presenter told me a startling fact. Americans decay at a slower rate than Europeans because we have many more synthetic chemicals in our bodies. The EU has banned over 1100 chemicals due to their toxicity. Of those 1100 chemicals, the FDA has only banned nine. The sheer discrepancy between the two in regulatory power and action is embarrassing. In fact, the lack of consistency in terms of regulation has stalled trade agreements between the U.S. and the EU. Until there is regulatory convergence, some free-trade agreements will continue to stall. It seems the EU is giving our treasured unregulated market the European equivalent the middle finger.

The system that sells clean is a vicious cycle: disease causes public fear of germs, driving the demand for some form of protection. The clean-industrial complex produces antimicrobial compounds that are ineffective and toxic both to humans and the environment; yet they fearmonger via advertisements. The federal regulatory agencies turn a blind eye until forced otherwise by grassroots movements. To make matters worse, federal bans on compounds like TCS or TCC encourages companies to replace them with other potentially harmful compounds in order to maintain their profit margins. The end result is the same: widespread health and environmental problems.

What are we supposed to do in the face of an oppressive and deceitful system that is capable of duping future doctors and former presidents? It is tempting to posit that we, as a society, need to be informed consumers and avoid these products. It is appealing because it puts the onus on us, as individual actors. Unfortunately, that argument does not work for two reasons. The first reason is rooted in inequality: not all consumers have equal access to the same information, nor have the education to understand the impact of chemical like TCS or TCC. It is unfair to expect everyone to be informed in an inherently unequal society. The second reason is practical. We simply do not have time to investigate every object we touch. For example, almost every dye used in clothes is toxic. Investigating our food, clothing, hand sanitizers, etc. are all laborious, time-intensive projects. The clean industrial complex profits from consumer ignorance, so instating real change must come from above.

The FDA and EPA need to have more teeth. Overhauling aspects like their data review process will help, and should be a top priority. In the absence of consumer activism, these federal organizations should be a voice for the voiceless. In doing so, they are automatically empowering us to be smarter, more informed consumers. We are not being sold clean; we are being sold toxins under the guise of cleanliness. It is time to end our war on microbes, and reclaim what we have lost: our capacity to think, our capacity for action, our environment, and our health.

ENDNOTES

1 Henry Blodget, "The President of the United States Shakes About 65,000 Hands a Year," *Business Insider* (2011).

2 The U.S. Centers for Disease Control and Prevention have stated that washing hands is the best way to reduce the num ber of bacteria. See: http://www.cdc.gov/handwashing/show-me-the-science-hand-sanitizer.html

3 Laura Barton, "Hand Sanitizers: Saved by the gel?" *The Guardian* (2012).

4 David Owen, "Hands Across America," *The New Yorker* (4 March 2013).

5 Gojo Industries, "Purell Primary Market Research" (2008). http://eportfolios.ithaca.edu/kpuleo1/docs/Purell_Ad_Campaign/Purell_Market_Resear.pdf

6 Rolf U. Halden. "On the Need and Speed of Regulating Triclosan and Triclocarban in the United States," *Environ mental Science & Technology* (48.7: 3603-3611, 2014).

7 To preserve the identity of my friend, I have changed her name.

8 Megan Gannon, "Triclosan, found in antibacterial soap and other products, causes cancer in mice." *The Washington Post* (24 November 2014).

9 Beyond Pesticides, "Triclosan," 2013. http://www.beyondpesticides.org/antibacterial/triclosan.php

10 Patricia Jennings, "Estimates Of Exposures And Risks To Aquatic Organisms From Releases Of Triclosan To Surface Water As A Result Of Uses Under EPA'S Jurisdiction" (4 September 2008). http://www.oehha.org/prop65/public_meetings/052909coms/triclosan/ciba12.pdf

11 The Environmental Protection Agency, "Triclosan Facts" (2010). http://www.epa.gov/oppsrrd1/reregistration/REDs/factsheets/triclosan_fs.htm

12 World Health Organization, "Dioxins and their effects on human health" (June 2014). http://www.who.int/mediacentre/factsheets/fs225/en/

13 Rolf U. Halden. "On the Need and Speed of Regulating Triclosan and Triclocarban in the United States."

14 Sabrina Tavernise, "F.D.A. Questions Safety of Antibacte–rial Soaps," *New York Times* (16 December 2013).