Sanitation and Sanitary Products:
Threats to Wastewater Systems

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Most wastewater systems can handle only human waste and toilet paper, as both safely disintegrate in water. Marketers of "flushable wipes" claim they clean better than toilet paper and are flushable; however, "flushable" does not mean disintegrable. In the United States (U.S.), residents flush wipes and other products that accumulate and create blockages that require costly repairs (Mitchell & Thamsen, 2017). New York City spent over 18 million dollars from 2010 to 2015 clearing out obstructions caused by wipes, such as clogged pumps and backed-up pipes (Flegenheimer, 2015). Despite the severe negative consequences of flushing wet wipes, usage rises. Social norms of cleanliness influence residents to maintain meticulous bathrooms free of detritus and odors (Lockyer, 2003). Using and flushing wet wipes improves personal and bathroom sanitation; however, water authorities have pleaded with residents to flush only human waste and toilet paper. They wish to provide clean water for residents: the same participant group that is seemingly acting against them. Regardless, third-party manufacturers still call their products flushable and residents have acted accordingly. Residents and manufacturers utilize changing cleanliness norms to develop new patterns in flushing behavior. Municipalities have attempted appeals to the greater good; however, they have been unsuccessful. For municipalities to succeed in affecting public flushing behavior, they must reassess their communication methods and promote modern alternatives to wipes.

Review of Research

Social and personal norms influence private behavior. Stern (2000) asserts that "personal moral norms are the main basis for individuals' general predispositions to environmental

actions." To affect how and what we flush, we must change norms first for policy change to succeed.

Conant (2005) describes bathrooms as spaces to expel fecal matter privately from homes and common areas. They also offer services to minimize disease transmissions with hand washing stations (Conant, 2005). Conant states that bathrooms are status symbols. In lesser economically developed areas, simply having a bathroom is seen as a sign of wealth. For areas where bathrooms are common, clean and meticulous bathrooms bring respect and social status to their owners.

In a study of general flushing behavior, Lute, Attari, & Sherman (2015) establishes that social norms of cleanliness and disgust sensitivity correlate strongest with how often participants flush after urination. Over 80% of participants stated they would be embarrassed if guests who used their bathrooms smelled or saw urine in the bathroom, as flushing afterward urinating is the social norm. Unsightly smells and odors from unflushed urine made participants with high disgust sensitivity uncomfortable. Some stated they feel that the extended presence of urine in the toilet spreads bacteria and germs, though urine is generally sterile.

Weinstein, Buck, & Young (2018) state that the elicitation of disgust by bodily fluids and excreta is a primal behavior. Bodily fluids can transmit harmful bacteria and parasites, and the avoidance of them protects humans from disease and ailments.

Strachan (1989) developed the "hygiene hypothesis" which originated from his findings that "higher standards of personal cleanliness have reduced opportunities for cross-infection. This may have resulted in more widespread clinical expression of atopic disease." Exposure to bacteria and pathogens strengthens immune systems. The rise of cleanliness standards correlate to the rise in allergies and other immuno-deficiencies.

Rise of Wet Wipes

Toilet paper as we know it was introduced in 1890 by Clarence and E. Irvin Scott (McRobbie, 2017). At the time, its taboo purpose made it difficult for widespread adoption: people did not talk about what they did in the bathroom. However, as in house bathrooms developed, toilet paper became a staple (McRobbie, 2017). Although slight variations have developed, the toilet paper on a roll that is used today is essentially the same.

The first flushable wet wipes for adult use were developed in the mid-2000s. At the time, the toilet paper market plateaued: no one was spending extra money for more toilet paper. Companies like Kimberly-Clark and Procter & Gamble wanted to develop ways to increase the purchasing of toilet paper so they repackaged baby wipes as luxurious adult toilet paper. The wet wipes were stronger than toilet paper and the moistness helped capture leftover residue. they were a big hit and the market grew quickly into a 2.2-billion-dollar industry as of 2015 (Kessler, 2016).

Cleanliness and Health

The direct health benefits of wet wipes have yet to be determined and cannot be used to justify wet wipe usage. Some doctors warn that “wiping [with toilet paper] could leave feces behind while excessive use could cause health problems such as anal fissures and urinary tract infection” (Young, 2017). However, Rohde Henning M.D. claims that to prevent anal fissures, people should use “a smooth dry article,” such as toilet paper (Henning, 2000). Wet wipes may offer temporary satisfaction, but they can cause anal irritation and perianal dermatitis: a bacterial

infection that inflames the anal region. In a personal study of his patients, all 19 patients who stopped using wet wipes after defecating had no recurrence of perianal dermatitis within the year (Henning, 2000). In an early gynecology study of prototype wet wipe usage for women, participants had mixed views. Some found the wipes to cause "minor stinging and burning symptoms" while others found it to be soothing for their vulvar region. A following clinical evaluation found that the prototype wet wipes have no significant effect on skin irritation in the vulva, perineum, and upper thighs (Farage et. al, 2009).

Despite the lack of definitive health benefits and consequences, the addictive physical feeling of cleanliness drives consumer support for wet wipe usage. One user of flushable wipes claims that "It's just a totally different feeling. You see what you were leaving behind" (Kessler 2016). Will Smith has called the feeling of using wet wipes as "special and incredible." Rapper Will.I.Am also expressed support for wet wipes: "Get some chocolate, wipe it on a wooden floor, and then try to get it up with some dry towels. … That's why you gotta get them baby wipes" (Young, 2017). Although debris cleaning is improved, only comfort is affected.

Other unnecessary hygiene trends, such as antimicrobial soaps, have developed in similar ways and can be used to explain the recent rise of wet wipes. In 1964, triclosan, the active ingredient in antimicrobial soaps, was developed. By 1970 it was common in hospitals as a surgical scrub (Rangel, 2017). According to Aiello (2007), in homes, antimicrobial soaps are "no more effective than plain soap at preventing infectious illness symptoms and reducing bacterial levels on the hands." Antimicrobial soaps can promote antibiotic resistance in bacteria and harm wastewater treatment plants (Aiello, 2007; FDA, 2019). Yet some assert that "using regular soap effectively does require a bit more time and care, especially when washing your hands" (Maid

Sailors, 2020). Manufacturers have marketed such products through misleading appeals to hygiene.

Bathroom Behavior

Bathrooms are no longer tiny water closets and outhouses; they are multipurpose rooms and should be treated as such. They no longer serve as a space to just defecate; rather, "[bathrooms are] definitely becoming the home's new room for enjoyment. The place where you relax and gather new energy for a hectic everyday life" (Quitzau 2008). Individuals associate bathrooms as places of self care. Residents put on makeup, perform skin care, and both start and end their days in bathrooms. Health and beauty have become synonymous and bathrooms provide the space to manage both. Some individuals also associate bathrooms as places to gather. For one family, "the bathroom becomes transformed into a family room during certain rush hours of the day in a busy family" (Quitzau 2009). The development of bathrooms into safe havens and common areas increase the standards of cleanliness of bathrooms to other rooms of the house. Individuals do not tolerate lingering odors in other rooms: why should they tolerate them in bathrooms now?

Residents' flushing behaviors are dictated by personal norms of cleanliness (Lute, Attari, & Sherman, 2015). Most individuals expect others and the spaces they inhabit to be fairly clean and well kept. Many particularly expect bathrooms, specifically personal bathrooms, to be meticulous. Individuals flush waste and used sanitary products, such as tampons and wet wipes, because the presence of them is seen as unclean and disgusting (Lute, Attari, & Sherman 2015). Western society has developed the norm that toilet paper belongs in the toilet and residents act accordingly. Many believe that having it outside in waste bins creates lingering odors and

spreads bacteria. However, the spread of bacteria in bathrooms is greatly attributed to flushing in general. Bacteria and fecal matter are aerosolized when flushed and spread to multiple surfaces in the bathroom (Barker & Jones 2005). Yet, this is relatively unknown or ignored. Regardless, in the trash, soiled wet wipes keep fecal matter lingering in the bathroom. Odors and visibility can be masked, but the risk of disease transmission, though to an unknown extent, persists (Mount Sinai Hospital, n.d.).

To successfully change flushing behavior, there needs to be a clear, relatable motive. Social norms of flushing urine have become loose with water conservation movements (e.g. “if it's yellow, let it mellow”). Reducing water usage by not flushing urine has both economic and environmental benefits at a cost of some comfort and is generally supported. However, the disposal of feces is not easily changed. Fecal matter evokes stronger primal feelings of disgust than urine. Feces is more unsightly and dangerous; it can transmit diseases such as cholera and typhoid to those in contact. The feeling of disgust protects humans as they naturally work to avoid coming in contact with feces (Weinstein, Buck, & Young, 2018). There is little support for movements that limit the flushing of toilet paper into sewer systems because individuals in the U.S. have not found motives that break down the barriers of disgust and cleanliness.

The reason other alternatives, such as bidets, have not succeeded in America is because of the change in behavior required compared to wet wipes. Bidets are water nozzles that direct a water stream to the anus and genitalia area to clear debris after using the bathroom. After use, toilet paper is used to clean/dry the area, although with a smaller amount than if the bidet is not used. In contrast, flushable wet wipes are used in the same method as toilet paper: they require little disturbance to a routine. Bidets require drastic change to both behavior and bathroom infrastructure (Hart, 2018). Despite economic and environmental benefits, bidets use less water

than it takes to make toilet paper per use, residents have decided that wet wipes are the preferred option (Yan, 2020).

Municipalities Views

Wastewater authorities seek to safely treat and "return [wastewater] back to the environment in the form of clean water to the rivers for vibrant aquatic life" (Rivanna Authorities, n.d.). They strive to keep physical contaminants, such as wet wipes and tampons, out of their systems as they many treatment plants cannot operate effectively when inundated.

The Effect of Wet Wipes on Infrastructure

Although manufacturers claim otherwise, flushable wet wipes harm wastewater systems. Although most wet wipes are labeled "flushable" in wastewater, as of 2018, no wipe has been found to disintegrate in wastewater systems (Campbell, 2018). Wipes flush down the toilet but accumulate in sewer systems and create obstructions. Removal of obstructions is costly and inconvenient for municipalities (Mitchell & Thamsen, 2017). New York City spent over 18 million dollars from 2010 to 2015 clearing out obstructions caused by wipes, such as clogged pumps and backed-up pipes (Flegenheimer, 2015). During the COVID-19 pandemic, the lack of available toilet paper increased flushable wet wipe usage and wastewater infrastructure suffered. there was a "coast-to-coast surge in backed-up sewer lines and overflowing toilets" according to plumbers and municipalities who begged residents to stop flushing wet wipes (Levenson, 2020). However, these requests fall on deaf ears as wet wipes usage grows.

Industry Needs

The U.S. wastewater infrastructure struggles to keep up with demand and wet wipes exacerbates the issue. The American Society of Civil Engineers (ASCE) gave the US wastewater infrastructure a "D+" grade due to the decaying infrastructure and lack of funding (ASCE, 2017). Currently, there are over 1.3 million miles of private and public connecting pipes and sewers that are susceptible to structural failure, blockages, and overflows (ASCE, 2017). Many municipalities currently struggle under just heavy rain conditions that cause sewage to overflow into local waterways. According to the Environmental Protection Agency's Facilities Registry Service Database, which primarily covers the compliance of wastewater treatment plants in the U.S., only 37 percent of U.S. wastewater treatment plants are compliant with EPA standards (EPA, 2020). With a projected funding gap between 20 and 120 billion dollars for US Wastewater Systems for the next 20 years, municipalities will begin to struggle to meet demand even more than they already do (EPA, 2008).

If funding needs are met and wastewater systems develop to better handle "unflushables," clogs and obstructions will still occur at similar, if not greater, rates. Residents will act accordingly if consumption is allowed to increase on wastewater systems. Increased efficiency does not decrease consumption; it increases consumption (Jevons, 1985). Improvements of wastewater systems should only be done to better handle human waste and water. Improved pumps and grinders will help break down wet wipes but will not change public behavior (Force, 2015).

If public behavior does not change, infrastructure will decline. Municipalities generally already cannot afford to maintain, replace, or expand wastewater systems as needed (Binea & Loebel, 2018). Wet wipes have been exacerbating systemic stresses. Municipalities need to reassess their communication with residents to ensure wastewater systems remain clear.

“Flushability”

The ambiguity and lack of binding legislature of the term “flushability” allows manufacturers to interpret it as they see fit. The Association of Non-Woven Fabric Industry (INDA), which represents companies throughout the entire non-wovens value-chain, established rigorous “Guidelines for Assessing the Flushability of Disposable Nonwoven Products” that outline multiple testing procedures for wipes. Any wipes that do not pass the disintegration tests must be labeled with a “Do Not Flush” symbol (INDA, n.d). However, there is no penalty for companies that do not follow the guidelines. Because all wipes can be physically flushed down the toilet, many use the technicality to call their wipes “flushable,” but not disintegrable which is what really matters for wet wipes.

Although many products actually pass the INDA tests, wastewater experts claim the tests are too rigorous and “fail to simulate real-life conditions in a sewer system.” Sewer systems are more passive and less turbulent than the tests simulate which prevent disintegration under real world conditions. However, Dave Rousse, president of the INDA, says a vast majority of problems [are] derived from “non flushable wipes inappropriately flushed” rather than the wet wipes used for bathroom use (Flegenheimer, 2015). He agrees that “the tests can be modified” to be more stringent, but stands behind the claim that other wipes are responsible for the issues. In 2013, Consumer Reports conducted an independent agitation test that none of the leading four wet wipes (Charmin, Scott, Cottonelle, and Equate) could pass (Kessler, 2016).

Even if legislation passes and “flushable” wet wipes are no longer labeled as such, residents' behavior will not change. Other sanitary products, such as tampons, have been labeled as non-flushable. Kotex, a popular tampon brand, actually labels their products as non-flushable.

On their website and some packaging, they state that tampons should be wrapped up and placed in a trashcan along with “do not flush” (Kotex, n.d.). However, in an unofficial survey of over 10,000 people, 50% of respondents reported that they flushed tampons but did not know they should not and 20% said they knew but chose to flush anyway (Bielanko, 2017). Although some companies properly label sanitary products and inform consumers, it can be said that they are only doing the minimum to educate communities on disposal methods.

Advertising Methods

Wet wipe usage is negatively correlated with the “taboo-ness” of toilet behavior. Television advertisements and social media campaigns were common in the 2000’s & early 2010’s: they focused on creating conversations about toilet behaviors. The more open individuals became about their behavior, the more attention wet wipes received on social media or through word of mouth. Ian Bell, the global head of tissue and hygiene research at Euromonitor in 2012, stated that “their attempt to normalize this product by getting it out in the open is really a useful tool” (Newman, 2012). Dude Wipes, a recent start-up in the flushable wet wipes market, found great success because they just wanted to “to have fun, make shit jokes, and kick ass” (Dude Wipes). Their marketing focuses on humor to destigmatize the conversation and their nationwide success proves that it works. From 2008-2018, wet wipe demand increased by over 5 percent each year (Pitman, 2015).

Manufacturers of flushable wet wipes use shame tactics to drive consumers to buy their products because insecurity about cleanliness is extremely prevalent. In a Cottonelle advertisement, Cherry Healy, a British spokeswomen known for documentary films on “uncomfortable subjects,” goes to a speed dating event to discuss “bum wiping habits” to the

other participants (Lieberman, 2014). When told that they use just toilet paper as a "dry wiper," Healy expresses disgust and pushes them to try Cottonelle flushable wet wipes (MyCheekyDate, 2014). In a Charmin ad, one character remarks to another that "you're not done yet! you might not be clean, until you use wet wipes" after they wipe with just toilet paper (truTV, 2015). Katherine Ashenburg, writer of the book *The Dirt on Clean: An Unsanitized History*, concluded that "Today there seems to be no resting place, no point at which we can feel comfortable in our own skins for more than a few hours after our last shower. Clean keeps receding into the distance" (Flora, 2008). Manufacturers want to inflate cleanliness standards because it creates more opportunities to make products. They push the notion that toilet paper does not cut it anymore: wet wipes are needed to be attractive and clean. Manufacturers also marketed toilet paper and wet wipes as a pair to increase consumption. In 2012, Cottonelle ran a campaign that implied that wet wipes should be used after toilet paper as a "a one-two process" because they are "the Perfect Match" (fig. 1). To destigmatize the process, Cotonelle renamed it.

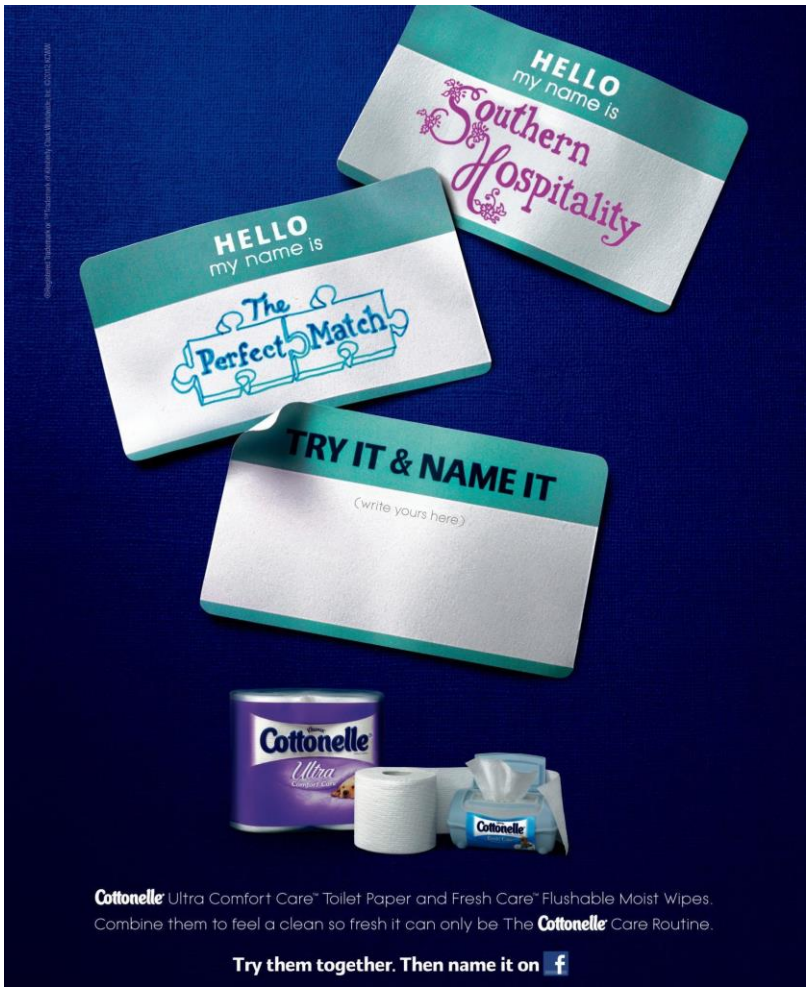

Figure 1: Cottonelle, "The Perfect Match" (Newman, 2012).

Conclusion

Although wet wipes provide only minor physical benefits, the psychological feelings of cleanliness, and the publics' insecurity of it, compels the usage of wet wipes despite their negative effects. Although the burden should lie with the individuals, municipalities must compel the public through alternative, yet similar means for cleaning. if consequences are not direct or immediate, individuals are not motivated to change arguable self-destructive behavior. Similar to the tragedy of the commons (Hardin, 1968), individuals must be compelled to act for the common good to prevent their own decline.

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