

Sustainability Assessment: Drano

ENVS 195: Science of Sustainability

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Lesley Bristol, Jamie MacLiesh, Chris Ripley, Erin Schminke, Matt Spaulding

Drano is a popular product made by SCJohnson that is used to unclog drains and is found under many kitchen and bathroom sinks in households and industrial facilities such as hospitals and restaurants. The Drackett Company first launched the Drano product in 1923. Drano was produced in crystallized form in its introduction. Bristol-Meyers bought the Drackett Company in 1965, and then sold it to SCJohnson in 1992. LiquidDrano, which is commonly used today, was launched in 1969 to compete with the Clorox product LiquidPlmbr.

The product comes in a variety of forms including liquid, foam, gel, crystal/solid, and industrial strength. Drano's website claims the product to be septic safe and will not harm bathroom and kitchen pipes and surfaces, such as ceramic, if used appropriately.

Drano's purpose as a product is inherently "unsustainable" because it has only a one-time use and there is no chance for it to be reused or recycled. Its chemicals are dumped down the drain to serve their purpose at clearing a clog, and then travel to water treatment and the nearest water source. Although Drano follows no immediate principles of environmental, social, or economic sustainability, what impact does it have on the environment, organism health, and society? Does its lack of sustainability create a negative impact, or does it have an impartial effect on our world?

The following report will analyze and compare the raw materials of Drano versus a leading alternative natural product, CitraDrain, its environmental and social impacts, and corporate practices relating to Drano and SCJohnson, as well as a concluding summary of opinions and recommendations regarding Drano for consumers and policy-makers. The report's main focus will be on the household liquid Drano product however there will be some analysis of industrial and crystallized Drano as well.

Material Assessment: Drano vs. CitraDrain

Drano:

Ingredients in Product	Origin of Ingredients	Environmental Effects
Sodium Hypochlorite (Bleach) NaOCl	Chlorine and the caustic soda solution are reacted to form sodium hypochlorite bleach	Possible mixing with minerals and elements in surface water to form a host of dangerous toxins (Possible production of Mustard gas if contact occurs with ammonia)
Water		
Sodium hydroxide (Lye or Caustic Soda) NaOH	Electrolytic chloralkali process	Breaks down in sodium cations and hydroxide anions. If it comes in contact with water it has the potential to decrease the acidity of the water. The production process includes the use of Heavy metals
Sodium Silicate (Liquid Glass)	Soda Ash (sodium carbonate) Sand (Silica)	Side effect of production is the creation of NaOH Sodium Silicate is a gelling compound which has minimal impact on the environment

Drano is a product of the combination of several different chemicals and water. The individual ingredients are manufactured through various methods of chemical production with the exception of water. The processes are energy intensive and use lots of different chemicals, some of which have negative impacts on the environment.

Bleach is produced through the combination of Lye (NaOH) and Chlorine (Cl). The side effects of bleach are the possible production of dioxins when interacted with surface water however most bleach producers claim to have no free chlorine present in the product. (Clorox, 2010) When bleach reaches the water system it is broken down in to salt, oxygen and water, and trace absorbable organic halides (AOX). Although a small portion of the product, the AOX has been shown to have negative effects on shellfish. The Nordic Ministers Conference lists bleach as one a dangerous chemical (LEAS.CA 2005).

Lye or Caustic Soda (NaOH) is another ingredient as well as part of the chemical formula for bleach. It is formed through the electrolytic chloralkali process. The main raw ingredient is salt. (Dow, 2010) One method of production calls for the use of Mercury, this process is slowly being phased out due to negative impacts of Mercury. (Eurochlor, 2010) The process is energy intensive. New production method of lye are working to be less costly, more energy efficient, and with less effect on the environment.

Sodium Silicate is a compound of Soda ash and sand. Soda ash (Sodium Carbonate) is derived from wood ashes in the form of a mineral alkali. It is produced through the combination of the two ingredients in high temperatures (Chemicaland21). The negative side effects of production are the amount of energy that goes into creating a high enough temperature for the chemical combination to occur.

The processes used to create the individual components along with the overall production are highly energy intensive and have the potential to have negative effects on the environment. None of the ingredients are specific to Drano and would still be in production if chemical drain cleaners were no longer being produced.

CitraDrain:

Ingredients in product	Origin of Ingredients	Environmental Effects
Natural Enzymes	Classified on the exact enzymes but some combination of proteases and amylases	Naturally occurring
Natural bacterial cultures	Classified	Possible beneficial effects on water treatment plants
d-limonene	Produced from orange rinds	Side effects of the peel steam production process
trace preservative (.01%)	Classified	Minimal due to low concentration
Biodegradable surfactant (anionic)	Natural fats and Fatty Oils	None

The natural enzymes in CitraDrain act as a catalyst. They help the product interact with the clogged drain to break up the clog to make it easier to pass through pipes. They also help the bacterial cultures by increasing the chance binary fission will occur. Binary fission is how bacteria reproduce.

Natural bacterial cultures are what does most of the work. The bacterial cultures eat away at organic matter which clogs the drain. With the help of the natural enzymes, the bacteria will reproduce rapidly; this leads to faster removal of the clog. Once the

cultures have reached the septic tank they will continue to break down organic matter. This leads to cleaner septic tanks and fewer sewage problems.

D-limonene, which is made from orange rinds, acts as a grease fighter. The orange rinds are often bought from other industries that use oranges, such as juice companies, which promotes less waste. According to Florida Chemical Company, Inc., industrial grade d-limonene should not be released in drains or sewers due to its toxicity. However, there are known bacteria that will reduce the toxicity. D-limonene is biodegradable and does not accumulate in the environment. It also acts as a fragrance.

The biodegradable surfactant is used to reduce the surface tension of the product. This allows it to move more easily through the clog; it also suspends the material in the liquid as it passes through the drain. The preservative keeps the d-limonene fresh.

Environmental, Health, and Social Evaluation

To many consumers Drano is initially thought of as extremely harmful to the environment. When our group began investigating this product, we shared this assumption. However, it ended up being difficult to find a lot of information condemning Drano as a toxic product to the environment. Below is a breakdown of the environmental, social and physical effects of Drano in relation to sustainability.

1) Environmental impact:

The level of sodium hydroxide (NaOH) of industrial formula Drano is weighted at 30-40 percent of the entire product (JohnsonDiversey, 2006) while standard household Drano liquid is weighted at 1-5 percent. Sodium hydroxide, also known as caustic soda, soda lye, and lye, is an alkaline substance with a pH

level of 13.5 (JohnsonDiversey, 2006). It is a corrosive material and is defined as “a hazardous substance under Section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of sodium hydroxide (HSDB, 2001). As a contaminant in surface water, the primary effect of sodium hydroxide would be to raise the pH” (OEHHA, 2003). Water has a neutral pH level of 7. Organisms can be extremely sensitive to changes in pH levels, and may experience acute and chronic physical effects if their environmental pH changes especially by a foreign chemical. However, the pH impact of NaOH only occurs in surface water, as the chemical neutralizes when coming into contact with soil and its organisms, therefore has no proven effect in groundwater. When NaOH is airborne, it “will readily combine with water vapor in air, and the resulting aerosol or mist will be corrosive” (OEHHA, 2003). This can have an effect on the process of respiration in organisms as well as cause irritation if it comes into contact with the dermis.

Under the SCJohnson Material Data Assessment Analysis, there was “No information available” under the ecotoxicity category of Drano. Initially this could be viewed as a positive assessment of the product, being that no detrimental effects could be found relating to Drano and the environment. However, this could also be because SCJohnson has not actively pursued studies on the effects of NaOH in relation to the natural world.

2) Social/ health impact:

Drano’s impact on the physical and social health of individuals and society was

found to be much more severe and explicit than its environmental effects. The Drano bottle is covered with warnings and directions on how to use the product in order to avoid injury or accidents. However, Drano's purpose as a product has evolved from household cleaning agent to something more sinister. The NaOH contents of Drano are fundamental in the synthesis of the narcotic methamphetamine. As stated by the OEHHA:

“Sodium hydroxide is used to make sodium, an alkali metal that functions as a catalyst in the anhydrous ammonia/alkali metal method (Nazi method) that reduces ephedrine and/or pseudo ephedrine to methamphetamine (Turkington, 2000). Sodium hydroxide is also used in the hydriodic acid/red phosphorus method to raise the pH of methamphetamine solutions that have an acid pH.”

The use of NaOH for methamphetamine production has contributed to an epidemic of addiction in the United States. The economic, health, and social impacts of this phenomenon are comprehensive and very drastic. This has a major impact on the sustainable growth of our country, considering the costs of law enforcement to counter the spread of methamphetamine, the finances required to treat addicted individuals, and the loss of economic productivity of people who focus their efforts on producing and using methamphetamine instead of being employed in mainstream society.

The physical production of methamphetamine is dangerous as many chemicals are mixed with potential for combustion, including NaOH. “Mixed with water, solid forms and concentrated solutions (>40%) of sodium hydroxide may generate enough heat to ignite combustible materials (ATSDR, 2000)... Sodium hydroxide also reacts with metals, such as aluminum, tin, and zinc, generating flammable hydrogen gas (Genium, 1999)” (p. 3, OEHHA). The acute and chronic effects of constant contact with NaOH in a household are detrimental as well, especially for children.

The risk of young children being around volatile products such as Drano in combination with other chemicals leaves them in a vulnerable position and at risk of injury or death if combustion occurs. Consistent interaction with these products can also cause chronic health problems. Within the context of methamphetamine production, Drano has contributed to the breakdown of family structures and multi-generational unsustainability.

Since NaOH is corrosive, contact via inhalation, ingestion, skin, and the eyes can acutely cause major irritation, vision problems, vomiting, shock if ingested, and even thermal and/ or chemical burns. Chronic exposure can cause nose and throat irritation, chest pains, dermatitis, and ulceration of the nasal passages (p. 4, OEHHA).” These effects are very severe and unfortunately much too common, as individuals do not heed the warnings and directions printed on the product’s container.

The misuse of this substance has caused physical and social disaster in recent years, destroying families, homes, and entire communities. Without stronger regulations, NaOH will continue to be used dangerously and will result in avoidable tragedy.

Corporate Practices

SC Johnson, manufacturers of many cleaning, pest control and air freshening products which Americans recognize as industry standards and household staples (brands such as Windex, Raid, Drano, Ziploc, Glade, etc.), has within the last 10 years taken considerable strides towards becoming a greener corporation. This however is a controversial issue amongst critics of corporate practices, who argue that the large-scale production of products including poisonous chemicals is inherently unsustainable. While this is indisputably a huge issue, the company seems less interested in producing

alternative, natural products that aren't poisonous, and more concerned with providing a useful and effective product to its enormous consumer base, and possibly even striking a balance between chemical effectiveness and sustainable responsibility.

In 2001, SC Johnson created the Greenlist process, which analyzes and classifies raw materials used in production into 4 categories: Best, Better, Acceptable, and 0-Rated materials. Their goal since the establishment of this process has been to limit the amount of “0-rated materials” used and maximizes the amount of “Best” materials, beyond the levels of legal regulation, as these have been determined by the company to be more environmentally friendly and sustainable. They report having increased their usage of “Best” materials from 4% in 2001 to 18% now, as well as improving their use of “Better” and “Best” usage in that same time frame to 44% as opposed to 18% in 2001.

Although these numbers are visually appealing, it is noteworthy to mention that the process of rating these materials and measuring the use of said materials is nothing short of an internal self-analysis. The ones conducting the analyses, and more importantly, the ones reporting the results, have the agenda and reputation of the SCJohnson Corporation to consider. In order for the Greenlist process to have true and pure significant bearing, it would need to be conducted by a third party organization independent of the corporation's own will.

An outcome of the SC Johnson Greenlist process is that the company places a green logo on their products, ensuring their customers that the product they are buying is “green” and sustainable, by their standards at least. This, from many environmental critics' perspectives, is an outright example of “greenwashing.” Their rationale is that because the company is producing and selling poisonous materials, which will eventually

leave the consumer's apartment and ultimately end up in the environment, (Drano is a perfect example of this) there is no way for the products to be sustainable. The argument is that the green logo itself is misleading, because the ingredients included in the products are not what a consumer would consider sustainable. This is seen by many as a blatant move by the corporation to jump on the proverbial “green” bandwagon.

In addition to criticism however, the SC Johnson Greenlist program has also received much praise and awards, most notably the EPA's Presidential Green Chemistry Challenge in 2006, and the EPA's first ever Lifetime Atmospheric Achievement Award in 2003. Aside from Greenlist activity, they also have involvement in a large number of social development programs, including The SC Johnson Fund, which provided funding for a Canadian hospital to afford an MRI machine, contributed money to Chinese earthquake victims, and donated money to support conservation biology in the Congo; Malaria Prevention Education in South Africa, Ghana and Mozambique; and dengue education and prevention programs. Something slightly concerning about the latter two programs, however, is that the programs, although beneficially educational to communities that otherwise might not have had an outlet for education on such topics, could also have ulterior motives of increasing consumerism. On their website it states “over time, these programs – sponsored by the Raid®, OFF!® and Baygon® brands in different countries – have become both public health programs and an important way of building brand awareness with the people who need our products.” It seems that the company sees this not only as an opportunity to help out communities but to also promote their company to new audiences. It is this dual motive situation that creates concern. The case could easily be made that although being accused of greenwashing.

SC Johnson is somewhat of a leader in the corporate sustainability revolution, with their level of corporate responsibility and environmental and social consciousness. Motives aside, they are realistically making strides as a corporation towards sustainability, and as a leader in this field, they are providing a positive corporate model for other companies to follow. It seems that the first steps toward building sustainability on a corporate scale may be or may seem superficial, but they are necessary to the progress towards sustainability.

Concluding Comments and Recommendations

Drano has been a popular product since its introduction in 1923. SCJohnson, the owners of Drano products since 1992, has evolved to become a more sustainable and ecologically gentle company with their Greenlist indicator model. To the extent that their changes are actually sustainable and not simply “greenwashing” is up for debate, however their actions can be commended as an initial step towards corporate sustainability and transparency regarding consumers. Their SCJohnson Fund has also contributed to greater projects relating to sustainability in less-developed countries. However, a critical thinker must consider what motive SCJohnson has in introducing their products to extremely vulnerable communities and if their relief and development work is just a greater marketing campaign to a untouched population.

Despite our initial opinions regarding Drano and its effect on the environment, we found that when appropriately used, Drano has minimal effects on the greater environment and the ecology of organisms. However, the unfortunate evolution of Drano

as a misused and abused product has made it volatile and detrimental in the context of sustainability.

Considering the contribution that Drano products has towards such a volatile substance as methamphetamine, greater awareness and regulation should be implemented to move towards other products such as CitraSolve, which has ingredients that are safer for human health, the environment, and society. There should be a proposal to regulate Drano products, such as has been done with ephedrine/pseudo-ephedrine products like cough syrup and suppressants, which are no longer over-the-counter because of their abuse in the creation of methamphetamine. Legislation would be essential in providing a macro-solution regarding this problem. If a bill were to pass providing stronger regulation of Drano and related NaOH products, there would be greater hope in reversing the encroaching epidemic of methamphetamine use in the United States. This would in turn bring familial, social, and economic sustainability back into affected communities.

On a smaller scale, consumers can opt for all-natural and/or homemade products that serve the same purpose as Drano if they feel strongly about the adverse effect the product has had on our society. CitraSolve is a fantastic example of an alternative product, which is gentle and unable to contribute to the creation of methamphetamine. A mixture of vinegar and baking soda can also be used, or even simply scalding hot water, which acts as a sterilizer.

Sources

- Alter, L. (n.d.). Greenwash Watch: SC Johnson's Greenlist : TreeHugger. *TreeHugger*. Retrieved November 27, 2010, from http://www.treehugger.com/files/2008/01/greenwash_watch_16.php
- Bleach. (n.d.). *Labor Environmental Society*. Retrieved December 1, 2010, from <http://www.leas.ca/BLEACH.htm>
- Caustic Soda. (n.d.). *The Dow Chemical Company*. Retrieved December 5, 2010, from <http://www.dow.com/productsafety/finder/caustic.htm>
- Drain Maintenance. (n.d.). *Ask A Plumber*. Retrieved December 1, 2010, from www.askaplumber.com/downloads/how-to/Drain_Maintenance.pdf
- Greenwashing | Seventh Generation. (n.d.). *Seventh Generation*. Retrieved November 27, 2010, from www.seventhgeneration.com/greenwashing
- How is Chlorine Made. (n.d.). *Chlorine Online*. Retrieved December 1, 2010, from <http://www.eurochlor.org/makingchlorine>
- IEHN Case Studies: SC Johnson's Greenlist. (n.d.). *IEHN Case Studies: SC Johnson's Greenlist*. Retrieved November 29, 2010, from <http://www.iehn.org/publications.case.scjohnson.php>
- Johnson Diversey, Material Safety Data Sheet. (2006). *Institutional formula drano*. Sturtevant, Wisconsin: JohnsonDiversey, Inc.
- Maker of Windex, Pledge, Drano Launches "Greenlist" Labeling | Ethical Shopping. (n.d.). *Ethical Shopping*. Retrieved November 27, 2010, from <http://www.ethicalshopping.com/food/packaged-products/maker-windex-pledge-drano-launches-greenlist-labeling.html>

- Rukavina, P. (n.d.). What clogged drains can teach us about sustainability. *ruk.ca - peter rukavina blogs*. Retrieved November 27, 2010, from <http://ruk.ca/content/what-clogged-drains-can-teach-us-about-sustainability>
- Salocks, C., PhD, DABT, & Black Kaley, K., PhD, DABT, (2003). Technical support document: toxicology clandestine drug labs: methamphetamine. *Sodium Hydroxide*, 1(7), 01-09.
- SC Johnson's Greenlist Process. (n.d.). *SC Johnson's Greenlist Process*. Retrieved November 27, 2010, from www.outdoorindustry.org/pdf/GreenlistProcess_Fava.pdf
- SC Johnson's Greenlist Program Earns Presidential Award for Green Chemistry | Business | GreenBiz.com. (n.d.). *Green Business News, Resources, and Sustainability Career Tools | Business | GreenBiz.com*. Retrieved November 27, 2010, from <http://www.greenbiz.com/news/2006/06/26/sc-johnsons-greenlist-program-earns-presidential-award-green-chemistry>
- SC Johnson's Greenlist remove 61+ million pounds of VOCs “ Press Releases on CSRwire.com. (n.d.). *Corporate Social Responsibility and Sustainability News, Press Releases, Feeds, Events and More*. Retrieved November 27, 2010, from http://www.csrwire.com/press_releases/22883-SC-Johnson-s-Greenlist-remove-61-million-pounds-of-VOCs
- SC Johnson: A Family Company. (n.d.). *SC Johnson: A Family Company*. Retrieved November 30, 2010, from <http://www.scjohnson.com/>
- SODIUM SILICATE (WATER GLASS). (n.d.). *Worldwide Chemical Information, Trading & Advertising*. Retrieved December 5, 2010, from

[http://www.chemicaland21.com/industrialchem/inorganic/SODIUM%20SILICA
TE.htm](http://www.chemicaland21.com/industrialchem/inorganic/SODIUM%20SILICA%20TE.htm)

- Technical Grade D-Limonene. (n.d.). *Florida Chemical* . Retrieved December 1, 2010, from www.floridachemical.com/301000_Technical_Grade_d-Limonene_MSDS.pdf
- The Clorox Company | Social Responsibility. (n.d.). *The Clorox Company* . Retrieved December 5, 2010, from http://www.thecloroxcompany.com/community/ourprodspgs/bleach_salt.html
- US Environmental Protection Agency. (n.d.). *US Environmental Protection Agency*. Retrieved November 27, 2010, from <http://www.epa.gov/>
- What's Inside SC Johnson. (n.d.). *What's Inside SC Johnson*. Retrieved November 27, 2010, from www.whatsinsidescjohnson.com/
- Viva Verde tips. (n.d.). *THE ROAD LESS TRAVELED STORE : Home*. Retrieved November 27, 2010, from <http://www.roadlesstraveledstore.com/blog/category/tips/>

Break Down of Member Contributions:

Lesley Bristol: Wrote Introduction, Environmental/Health/Social Impact, Conclusion/Recommendations sections of report, final-edited report, created Power Point, final-edited Power Point, presented Power Point

Jamie MacLiesh: Wrote Corporate Practices section of report, contributed Corporate Practices slides of Power Point, ran slides of Power Point

Chris Ripley: Contributed to Chemical assessment of Drano vs. CitraDrain section of report, final-edited Power Point

Erin Schminke: Contributed to Environmental/Health/Social Impact section of report

Matt Spaulding: Contributed to Chemical assessment of Drano vs. CitraDrain section of report, final-edited Power Point, presented Power Point