

How household cleaning products impact septic systems

The cleaning products we use in our homes end up being discharged into a septic system or public sewer system. These products contain chemicals that have various impacts on our health, waterways, and septic systems.

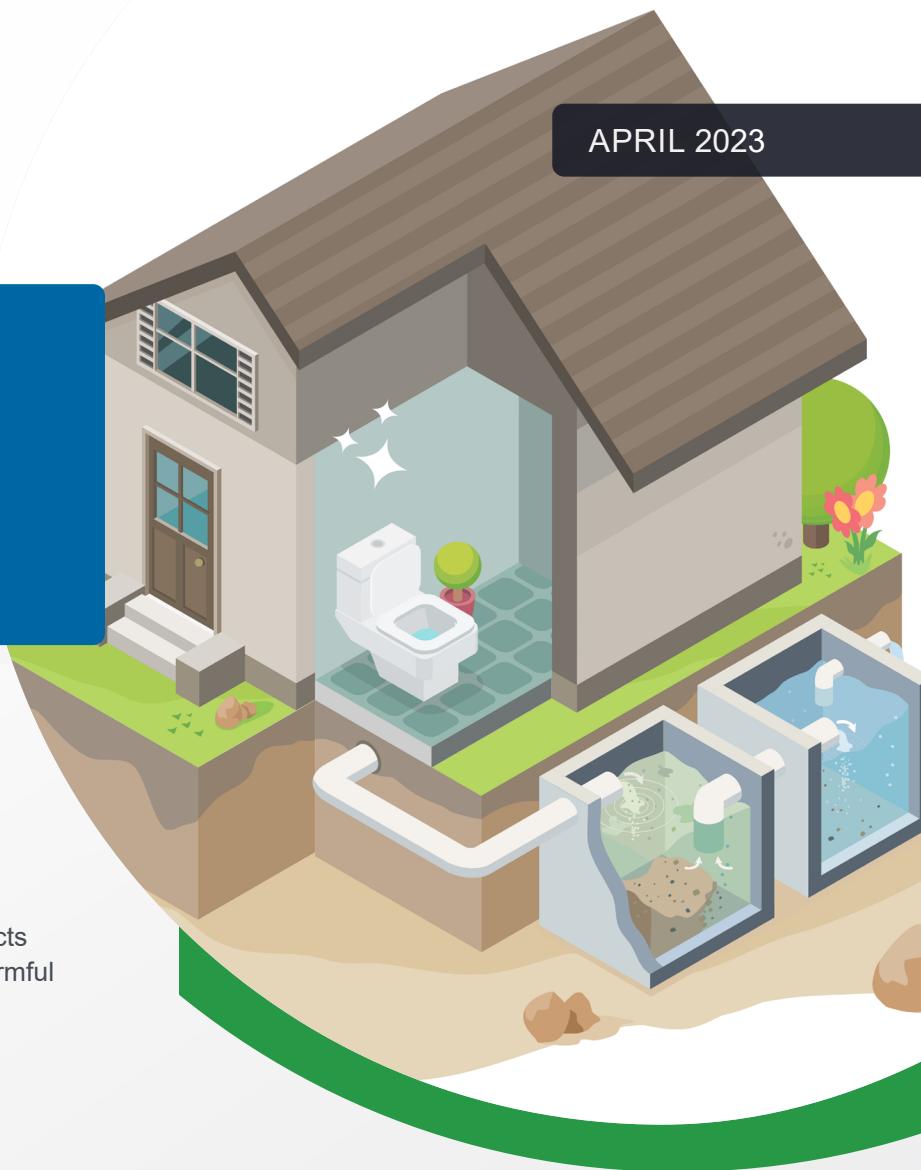
Let's take a look at which household cleaning products can generally be considered safe and have no harmful effects when discharged into septic systems.

HARMFUL EFFECTS ON SEPTIC SYSTEMS

Each year, DBO Expert's technical teams travel around Quebec inspecting wastewater treatment systems. When they encounter malfunctions, they do a careful examination for probable causes. Shockingly, the sole cause of the problem in many cases is the use of powerful or large quantities of household products. Figures 1 and 2 show the contents of some of the septic tanks that we have analyzed. The whitish or completely black water, often without bubbles, indicates a very low presence or complete absence of bacterial activity.

A septic tank is an essential part of an onsite wastewater management system, as it is where primary treatment takes place. In this process, the solids settle and form sludge at the bottom of the tank and the fats float to the surface. This segregation and the liquefaction of pollutants take place thanks to the action of anaerobic bacteria (bacteria that can live and grow without oxygen).

If the primary treatment is disturbed by toxic chemicals, however, the pollutants are carried to the next elements of the system and can interfere with the treatment that is



supposed to happen (e.g., by clogging pipes).

In addition, this causes much stronger foul odors than usual. Methane and hydrogen sulfide are usually produced during the decomposition of waste in anaerobic mode in the septic tank. But when chlorine-based cleaning products are present, highly toxic gases such as chloramine and free chlorine are also produced (we will take a closer look at these gases in the next section).

Residues of household cleaning products continue through the treatment chain, eventually entering aquatic ecosystems or being absorbed into the soil. Unlike large municipal wastewater treatment plants, onsite wastewater systems do not have chemical treatment facilities, so residues and by-products of household cleaners are not neutralized in the biological treatment process. Almost 20% of wells and waterways in the United States show traces of detergents and disinfectants. The situation is similar in Canada.

SCIENTIFIC DATA

What does the scientific research tell us? Several institutions have carried out studies specifically on this topic, but none recently. Tests conducted at the University of Arkansas showed that household products used in normal, manufacturer-recommended quantities do not significantly influence the performance of septic tanks or onsite wastewater treatment systems. However, these same products have a serious adverse effect if discharged in larger quantities into sewers (Gross, 1987). Similar findings were later published by other researchers (Edwards, 1996; Ip & Jowett, 2004).



Figure 1. Effects of cleaning products on septic tanks



Figure 2. Effects of cleaning products on septic tanks

The products evaluated in Gross's study include liquid bleach, Lysol liquid disinfectant, and Drano crystal clog remover. Field research has shown the real effects of the chemicals found in these products in terms of reducing the number of bacteria in the septic tank and the time it takes for the bacterial population to recover. The results were striking:

Chemical product	Volume	Recovery time of bacterial flora (hours)
Liquid bleach	9.9 litres (2, 62 gallons)	30
Lysol liquid disinfectant	19 litres (5 gallons)	60
Drano crystal clog remover	37.8 grams (1.3 ounces)	48

Table 1 Chemical concentration to completely destroy bacteria in a 3780-litre (1000-gallon) domestic septic tank

Obviously, no one uses 10 L of bleach or 19 L of Lysol to disinfect their toilets or clean their floors at home. However, large quantities of sodium hypochlorite, the active ingredient in bleach, are sometimes used to disinfect drinking-water wells (MELCCFP, 2023). Also, these studies did not assess the effect of repeated or even daily application of these products.

As the Arkansas study shows, even small doses of crystal clog removers can affect the functioning of a septic system. The main active chemical ingredient in these products is sodium hydroxide (NaOH) or another strong base. While some manufacturers claim that these products are safe for all pipes and septic tanks, scientific research has proven their harmful effects. Put simply, they are caustic chemicals. And, unfortunately, their negative impacts are not limited to septic tanks.

A 2008 study found that sodium hypochlorite, the active ingredient in bleach, in contact with organic chemicals such as surfactants and fragrances that are contained in many household cleaning products, can react to create chlorinated volatile organic compounds (CVOCs). Some of these chlorinated compounds emitted during application of the products are toxic and likely carcinogenic to humans.

Significant increases in the concentrations of CVOCs, particularly carbon tetrachloride and chloroform, have been observed in indoor air when products containing bleach are used. The increase in concentrations was lowest for ordinary bleach and highest for the thick liquid and gel products.

Thus, when bleach comes into contact with something as common as soap residue, it can cause exposure to hazardous compounds by inhalation (Odabasi, 2008).

Chlorine-based substances can also react with other common household chemicals such as vinegar or ammonia to produce toxic gases. Mixing an acidic cleaner such as vinegar with a hypochlorite bleach can produce chlorine gas (Cl₂).

The hypochlorites in liquid bleach and bleaching powder can also react with ammonia to form substances such as monochloramine (NH₂Cl), dichloramine (NHCl₂), and nitrogen trichloride (NCl₃). Similar reactions can occur with amines or related compounds and biological materials such as urine (the result depends on temperature, concentration, and how the products are mixed).

These compounds are highly irritating to the eyes and lungs and are toxic above certain concentrations (Crites and Tchobanoglous, 1998; Krieger and Sullivan, 2001).

A worrying new development is gaining steam in the chemical industry as specialized companies vie to develop more and more powerful disinfectants. Hypochlorous acid (HClO), for example, is the most effective disinfectant available in dilute solution of the chlorine family. It is estimated to be 80 to 120 times more effective than sodium hypochlorite.



As hypochlorous acid has no charge and a relatively low molecular weight, it can penetrate cell walls better than other chlorine-based disinfectants. In the past, no one was able to create hypochlorous acid in a stable solution with a shelf life longer than about four hours, making it unusable.

However, advances in chlorine chemistry have enabled one company to stabilize a solution with a shelf

life of 18 months (Cleanroom Technology, 2013). This product was developed for use in pharmaceutical and healthcare environments. However, professional-grade products are gradually entering the residential cleaning markets.

Another strong acid, hydrochloric acid, is the main active ingredient in the powerful toilet bowl disinfectant Lysol.

SAFE HOUSEHOLD PRODUCTS FOR SEPTIC SYSTEMS

An officially recognized “septic safe” certification has yet to be established. Nonetheless, government agencies and environmental organizations in Canada and beyond are almost unanimous in their recommendations for owners of onsite septic systems.

The following are some of the products that should not enter your septic system, either directly into the tank or through your toilets or sinks (based on Quebec government recommendations):

- **Paint**
- **Toxic or flammable products**
- **Floor waxes, carpet cleaners**
- **Products for unclogging pipes**
- **Chlorine, chlorides, spa and swimming pool maintenance products**
- **Drugs**
- **Excessive quantities of household cleaning products (ecological household products are recommended)**
- **Cooking oils, fats, and body oils**

SepticSmart, a national program in the U.S. that is also active in some Canadian provinces, adds several products to the list of those that should not be discharged into drains that run to septic tanks including car care products, pesticides, and insecticides.

EWG's Guide to Healthy Cleaning, published by the Environmental Working Group, contains a surprising claim that most of our household cleaning can be effectively performed with a mixture of a fragrance-free liquid soap and white vinegar or baking soda, depending on the application (EWG, 2023).

Other sources also recommend borax as a natural cleaner. Borax is marketed as a green product because it does not contain phosphates or chlorine; its main ingredient is sodium tetraborate, which is a natural mineral. Sodium tetraborate is controversial, however, having been linked with negative health effects such as developmental, endocrine, and reproductive issues, skin irritation, allergies, and breathing difficulties.

As we have no official certification to rely on yet, the best strategy is simply to read the lists of ingredients on household product labels and make careful choices. There are three basic criteria to look for in assessing whether a product is "Septic Safe":

- **100% natural**
- **Biodegradable**
- **As few ingredients as possible**

Based on these principles, Marseille soap is an excellent cleaning product. Manufactured through a process of hot saponification of olive oil, this venerable soap does not use chemicals to kill bacteria.

Its cleaning and disinfecting action is produced via the soap's micelles, which trap and dislodge oils so bacteria can be carried to the wastewater treatment system where their presence is beneficial. Marseille soap does not contain glycerine, which is a compound produced naturally during the saponification process, but is removed along with any impurities in the soap.

As a result, Marseille soap does not clog appliance pipes or stick to clothing and other surfaces.

There are also alternatives to disinfectants and bleaches that contain chlorine. One is oxygen bleach, also known as sodium percarbonate or solid hydrogen peroxide. This product is completely safe for septic systems and environmentally friendly since its cleaning reaction releases only water and oxygen.

When it comes to products for unclogging pipes, avoid chemical drain openers. Try a plunger or drain auger along with a combination of baking soda and vinegar. If necessary, sparingly use a liquid drain cleaner, which is usually much less aggressive than a crystal product.

CONCLUSION

To prevent the functioning of your septic system from being impaired, avoid chlorine-based anti-bacterial cleaners and disinfectants and caustic compounds.

Always read the product labels and decide based on the product composition. Whenever possible, choose 100% natural and biodegradable products with as few ingredients as possible.

These simple strategies will help protect both the environment and your own health.

Faced with the recurring question from our clients, the DBO Expert team has identified a biodegradable cleaner, stain remover, and degreaser with antiseptic and disinfectant properties that removes bacteria without destroying them. We have analyzed the documentation, conducted tests, and are so confident in its effectiveness that we have put our name on it. For more information on this product line, visit our website: dboexpert.com

REFERENCES

1. Crites, R. W. & Tchobanoglous, G. (1998) Small and decentralized wastewater management systems. Boston: WCB/McGraw-Hill (McGraw-Hill series in water resources and environmental engineering).
2. Cleanroom Technology (2013) The science of chlorine-based disinfectant. [\[web\]](#)
3. Edwards, D.E. (1996) THE IMPACT OF DISPOSING HOUSEHOLD CLEANING PRODUCTS IN WASTEWATER TREATMENT SYSTEMS. Prepared for THE SOAP AND DETERGENT ASSOCIATION.
4. EWG (2023) Environmental Working Group's Healthy Cleaning Guide. [\[web\]](#)
5. Gross, M.A. (1987) Assessment of the Effects of Household Chemicals Upon Individual Septic Tank Performances. Arkansas Water Resource Center, Fayetteville, AR. PUB131. 26.
6. Ip, I. & Jowett, E.C. (2004) The Effect Of Household Chemicals on Septic Tank Performance.
7. Krieger G.R., Sullivan Jr J.B. (2001) Clinical environmental health and toxic exposures (2nd ed.). Philadelphia, PA: Lippincott Williams & Wilkins. p. 968.
8. MELCC (2021) DOCUMENT DESTINÉ AUX PROPRIÉTAIRES D'UNE RÉSIDENCE RACCORDEE À UNE INSTALLATION SEPTIQUE. GUIDE DE BONNES PRATIQUES. [\[web\]](#)
9. MELCC (2023) La qualité de l'eau de mon puits. [\[web\]](#)
10. Odabasi M. (2008) Halogenated volatile organic compounds from the use of chlorine-bleach-containing household products. Environmental Science & Technology. 42 (5), p. 1445–1451. ification à chaud de l'huile d'olive. Son pouvoir nettoyant et désinfectant est assuré par la capture des huiles grâce