

Over-Sanitizing: The Health Effects of Cleaning Chemical Exposure

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In this strange new world that we live in due to COVID-19, our collective use of cleaning chemicals is skyrocketing. According to the Centers for Disease Control and Prevention (CDC), the daily number of calls to poison control centers for incidents involving exposures to cleaners and disinfectants increased sharply at the beginning of March 2020, just as COVID-19 was escalating. [\(1\)](#) However, even before the novel [coronavirus](#) pandemic hit, our use of cleaning chemicals was already a problem.



Are there health risks related to over-sanitizing? iStock/Maridav

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The unfortunate news is that many of the cleaning products we use in our schools, hospitals, workplaces, and homes pose significant risks to our health, COVID-19 notwithstanding. (2) While keeping our indoor environments clean is essential for our health, there are better ways to accomplish this than with [chemical-laden cleaning products](#). **Read on to learn how harsh cleaning chemicals harm our health and what alternatives you should use instead for creating a safe, clean indoor environment.**

Many cleaning supplies pose health risks of their own. Check out [this article](#) to learn more about the problems with over-sanitizing and get safer alternatives. #healthylifestyle #chriskresser

Are We Over-sanitizing Our Indoor Environments?

We humans clean ourselves and our environments for a variety of health-related, cultural, and aesthetic reasons. The earliest recorded use of soap dates back to 2800 BC in ancient Babylon. (3) The rise of human civilization and urbanization spurred significant changes in our built environments, requiring our ancestors to clean their living spaces routinely to remain healthy. The ancient Egyptians mixed wood ashes and water together to make lye, a strongly alkaline solution with bactericidal properties, which they used to clean various surfaces.

The Western world's obsession with cleanliness really took off with the advent of synthetic disinfectants. Chlorine-based bleaches were invented in Europe in the late 1700s, and quaternary ammonium disinfectants were discovered in the early 20th century. The synthetic antibacterial compound triclosan was discovered in the 1960s and was rapidly incorporated into various cleaning and personal care products. Today, we routinely use dozens of synthetic chemicals to clean our indoor environments, including many with sketchy safety records. (4) The combinations of cleaning chemicals we use may be more hazardous than using any chemical on its own. Furthermore, research indicates that our excessive use of cleaning chemicals is promoting antibiotic resistance, a significant public health problem. (5)

Our obsession with sanitizing our environments doesn't just expose us to toxic chemicals; it also disrupts the microbial ecosystems on our skin, in our gastrointestinal tracts, and even in our living spaces. The [hygiene hypothesis](#) posits that a lack of exposure to particular microorganisms, particularly in the early years of our lives, predisposes us to disease down the road. **Over-sanitizing our environments may thus be obliterating the beneficial microbes on, in, and around us, disrupting our biology in the process.**

Harmful Chemicals in Common Cleaning Products

The cleaning products we use daily to sanitize our indoor environments contain an astounding spectrum of chemicals. Some of the main chemicals present in cleaning products include:

- Quaternary ammonium compounds (QACs)
- Sodium hypochlorite (aka bleach)
- Glutaraldehyde
- Ethanolamine
- Sodium lauryl sulfate (SLS)
- Triclosan
- Volatile organic compounds (VOCs)
- Phthalates and "fragrance"

QACs

QACs are disinfectants commonly used in workplaces, healthcare settings, and homes. (6) In the healthcare industry, QAC-based sanitizers have replaced many alcohol-based hand sanitizers. Many children routinely apply QAC-based sanitizers to their hands at school to decrease the spread of infectious illnesses and reduce sick days. However, despite the prevalence of QAC in cleaning products, few studies have thoroughly assessed their long-term safety. **Emerging research indicates that QACs target several body systems, including the central nervous system and reproductive systems.**

Sodium Hypochlorite (Otherwise Known as Bleach)

Bleach is a housecleaning staple for many people, but its ubiquity in our homes is not a confirmation of its safety. It has corrosive effects on the skin, with accidental exposures causing severe dermal reactions. Inhalation of bleach fumes irritates the airways. (7) Accidental internal ingestion of bleach causes **metabolic acidosis**, **hyponatremia** (a high concentration of sodium in the blood), and **hyperchloremia** (an excess of chloride ions in the blood).

Bleach becomes particularly dangerous when it is mixed with other household cleaners. (8) For example, combining ammonia (found in products such as toilet bowl cleaner) with bleach produces chloramine gas, a highly irritating gas that can be deadly when produced in large quantities. The combination of bleach fumes and limonene, a citrus compound found in cleaning products such as Lysol, with ultraviolet light creates fine particulate matter that lingers in the air, reducing indoor air quality and causing harm to the respiratory system. (9)

Glutaraldehyde

Glutaraldehyde is a disinfectant but also has preservative and fixative properties. As a disinfectant, it is used to sterilize surgical instruments and other surfaces in hospitals. It is found in Cidex, a high-level disinfectant used in medical facilities. According to the Occupational Safety and Health Administration (OSHA), glutaraldehyde can cause acute reactions, such as coughing and headaches, and chronic effects, such as “occupational asthma.” (10)

Ethanolamine

Ethanolamine is a surfactant, or a substance used to lower the surface tension between two liquids. This makes it a useful addition to cleaning products, allowing the other ingredients in the cleaning products to spread over a larger surface area. Ethanolamine is found in drain cleaner, stovetop cleaners, and stain removers and is harmful to the skin, respiratory tract, and central nervous system.

SLS

SLS is a detergent and surfactant found in many [personal care products](#) and cleaning products. It is found in floor cleaners, countertop cleaners, and dish soap. It is a known skin irritant and, as we'll discuss later, disrupts the skin microbiome and barrier integrity. [\(11\)](#)

Triclosan

Triclosan is found in myriad personal care and cleaning products. **However, concerns about its effects on antibiotic resistance led to it being banned for use in soap products by the U.S. Food and Drug Administration (FDA) in 2016.** [\(12\)](#) The FDA's ban hasn't stopped it from being used in cleaning products, including hand sanitizers and dish soap. Concerningly, manufacturers are not required to list triclosan as an ingredient on cleaning product labels; instead, triclosan may hide beneath claims such as “antibacterial” and “odor-fighting.” [\(13\)](#)

VOCs

VOCs are gases emitted from various products, including furniture, paint, varnishes, and cleaning products. **Research indicates that concentrations of VOCs are up to 10 times higher indoors than outdoors.** [\(14\)](#) The high levels of VOCs found indoors may be due in part to our overenthusiastic use of VOC-emitting cleaning products. On their own, VOCs can cause:

- Nose and throat discomfort
- Fatigue
- Dizziness
- Headaches

In combination with ozone, which can linger in indoor air, VOCs produce formaldehyde, an odorous gas that irritates the eyes, nose, and throat.

Phthalates and “Fragrance”

Phthalates are plasticizers or compounds that increase the flexibility, transparency, and durability of plastics. However, they are also added to personal care and cleaning products primarily as carriers for fragrance to make synthetic fragrances (think: Febreze) last longer. Like triclosan, phthalates often aren't labeled explicitly on cleaning products; instead, they frequently hide under the generic name “fragrance.” [\(15\)](#)

Now that we've discussed several of the most harmful cleaning chemicals, what products should you avoid? Chlorine bleach; conventional drain, oven, and toilet bowl cleaners; furniture and floor polish; and aerosol spray products are the most significant culprits. We'll talk more about what products you should use to replace these shortly.

How Harsh Cleaning Chemicals Affect Your Health

I briefly touched on some of the harmful health effects of cleaning chemicals in our discussion above; however, the truth is that the health effects of cleaning chemicals extend far beyond respiratory tract and skin irritation. These chemicals impact diverse body systems and, in some cases, may cause adverse transgenerational effects.

Respiratory Function

Respiratory ailments are some of the most common health problems caused by cleaning chemicals. **Concerningly, early-life exposure to heavy doses of cleaning chemicals appears to be detrimental to long-term respiratory function, increasing the risk of childhood [asthma](#) by damaging lung epithelial cells through innate immune pathways. (16)**

QACs, bleach, glutaraldehyde, and ethanolamine all can cause respiratory irritation, exacerbate existing asthma, or trigger “occupational asthma,” or asthma caused by breathing chemical fumes on the job. “Fragrance” is also a notorious trigger for respiratory issues. (17)

Liver and Kidney Damage

High-level exposure to cleaning chemicals is known to cause liver and kidney toxicity. Solvents and QACs have particularly concerning effects on liver and kidney function and can induce liver and kidney toxicity when people are accidentally exposed to large doses. (18, 19) While more research is needed, we can’t rule out the possibility that low-level, chronic exposure to these cleaning chemicals may also negatively impact our liver and kidney function.

Immune Function

QACs may be directly toxic to the [immune system](#), decreasing the phagocytic function of macrophages, which are essential frontline defenders in your body’s immune response to pathogens. (20) **It is rather ironic (and alarming!) to think that our obsession with sanitizing our environments could actually be decreasing our ability to fight off pathogens, rather than protecting us.**

According to the U.S. Department of Health and Human Services, the immunotoxicity of glutaraldehyde has “not been adequately assessed,” yet we continue to allow it to be used in hospitals, where immune-compromised people may be highly exposed to the compound. (21)

Metabolic Health and Obesity

Abundant research indicates that anthropogenic chemicals have harmful effects on hormonal balance and body weight in a wide variety of animals, from frogs to humans. Many of these hormone-disrupting, obesogenic chemicals are found in the cleaning products that we use day in and day out. (22)

A primary mechanism by which cleaning chemicals may disrupt hormones and promote obesity is via alteration of the gut microbiome. (23) One study evaluated infants' gut microbiota when they were three to four months old and then again at one and three years of age. Alterations in the children's gut flora were strongly associated with heavier household disinfectant use in the children's homes. Interestingly, the same association was not found with eco-friendly cleaners. The children with heavier disinfectant exposure also had higher body mass indexes at age three compared to their less-exposed peers. This is concerning data, given that infancy and childhood represent a crucial period for shaping the gut microbiome, immune system, and metabolism. Chemical exposures that occur during this time window may disrupt health for years to come, if not across the entire lifespan.

Thyroid Function

Phthalates found in cleaning chemicals may also [impair thyroid function](#). Prenatal phthalate exposure decreases total thyroxine (T4) levels in pregnant women, an effect that may have adverse impacts on fetal development and infant health. (24) Even small doses of triclosan disrupt thyroid function in mice by suppressing hypothalamic gene expression. (25)

While the biological mechanisms of phthalates on thyroid function are not yet fully explained, phthalates may interfere with the binding of T3 to transthyretin, a protein that transports T3 and T4 in the blood, carrying them to target tissues. This phenomenon would inhibit transport of T3 and T4 to tissues and cells, inhibiting physiological functions regulated by thyroid hormones.

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