

The Dirt on Antibacterial Soap and Hand Sanitizers

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STORY AT-A-GLANCE

- › Routinely disinfecting your body and surroundings may actually cause more harm than good in the long run. Not only do they promote the development of drug-resistant bacteria, antibacterial compounds such as triclosan and quaternary ammonium compounds (QACs or “quats”) have also been linked to a number of harmful health effects
- › Research has shown triclosan is a potent endocrine disruptor that interferes with thyroid function. Endocrine-disrupting chemicals can promote a variety of health problems, including obesity, breast, ovarian, prostate and testicular cancer, preterm and low birth weight babies, precocious puberty in girls and undescended testicles in boys
- › The U.S. Food and Drug Administration banned triclosan from soap products in 2016 due to suspected health risks, but it’s still found in many toothpastes, mouthwashes and hand sanitizers. Triclosan also makes its way into our food supply; it’s routinely found in lakes, rivers, streams, wastewater, irrigation water and biosolids applied to fields as fertilizer
- › QACs are found in cleaning products, hand sanitizers, personal care products, many kinds of wipes (surface, baby, hand and disinfecting wipes) and certain pesticides
- › Adverse health effects of QACs include allergic contact dermatitis, asthma and COPD, suppressed immune function, reduced fertility, impaired embryo development and developmental disorder, mitochondrial dysfunction and an increased risk of antimicrobial resistant infections

Washing your hands is at the top of the list when it comes to effective prevention of contagious illnesses and infections, but many still make the mistake of assuming you

have to use antibacterial soap to get the job done right.

The same goes for other household cleaning. Routinely disinfecting your body and surroundings may actually cause more harm than good in the long run. Not only do they promote the development of drug-resistant bacteria, antibacterial compounds such as triclosan and quaternary ammonium compounds (QACs or "quats") have also been linked to a number of harmful health effects.

Adverse Health Effects of Triclosan

Starting with triclosan, research has shown it's a potent endocrine disruptor that interferes with thyroid function.^{1,2} Hormone-disrupting chemicals are a serious concern, as they can promote a wide variety of health problems, including obesity, breast, ovarian, prostate and testicular cancer, preterm and low birth weight babies, precocious puberty in girls and undescended testicles in boys.

Triclosan also has adverse effects on cellular function, molecular pathways and mitochondrial function, all of which are described in a 2018 paper.³ According to that report, an estimated 75% of the U.S. population is exposed to triclosan via consumer goods and personal care products.

The U.S. Food and Drug Administration banned triclosan from soap products in 2016 due to suspected health risks, but it's still found in many toothpastes, mouthwashes and hand sanitizers. It also makes its way into our food supply, as it's routinely found in lakes, rivers, streams, wastewater, irrigation water and biosolids applied to fields as fertilizer. As reported in this 2018 study, triclosan:

Is readily absorbed into human skin and oral mucosa and found in various human tissues and fluids

Has cytotoxic effects and is associated with cancer development, especially liver cancer

Is proinflammatory and enhances production of reactive oxygen species (ROS)

Decreases cardiovascular and skeletal muscle function due to its effects on calcium signaling in muscle cells

Is correlated with reproductive and developmental defects, and has been linked to higher rates of miscarriage – a potentially serious concern, considering traces of triclosan have been found in 100% of all urine samples collected from pregnant women and 51% of cord blood samples⁴

Is associated with an elevated risk of allergies, asthma and food sensitivities, especially in children under 18

Promotes the proliferation of antibiotic-resistant pathogens

'Quats' – Another Harmful Class of Antimicrobials

The proliferation of quaternary ammonium compounds or "quats" is also raising concern. As reported in a 2023 review published in Environmental Science & Technology:⁵

"Quaternary ammonium compounds (QACs; also referred to as quats) comprise hundreds of chemicals and mixtures. QACs serve many different functions, primarily as antimicrobials, surfactants, preservatives, antistatic and softening agents, and dispersants.

They are often found in cleaning products, hand sanitizers, personal care products, many kinds of wipes (surface, baby, hand, and disinfecting wipes), and various pesticidal products ...

Adverse ecological effects include acute and chronic toxicity to susceptible aquatic organisms, with concentrations of some QACs approaching levels of concern.

Suspected or known adverse health outcomes include dermal and respiratory effects, developmental and reproductive toxicity, disruption of metabolic function such as lipid homeostasis, and impairment of mitochondrial function. QACs' role in antimicrobial resistance has also been demonstrated ...

Large-scale fogging and spraying of products containing QACs occurs as a COVID-19 control measure, despite the World Health Organization and US Centers for Disease Control and Prevention discouraging these practices as ineffective and potentially harmful.

Additionally, use of certain QACs has increased in recent years because they are frequent replacements for the 19 active ingredients, including triclosan and triclocarban, banned from use in over-the-counter hand and body washes ...

While QACs can kill or inactivate a number of different microorganisms in controlled laboratory settings, which is often presumed to be beneficial and marketed to create an impression of cleanliness, evidence of QAC effectiveness in reducing transmission of infectious disease in real world settings and applications, such as the field of healthcare, is limited.

In addition, no high-quality evidence shows that antimicrobials bonded to surfaces reduce healthcare acquired infections."

While research is limited, what we do have shows quats pose serious risks to the environment, especially marine life. Disturbingly, these chemicals are flushed down the drain in such quantities that "QAC concentrations in aquatic ecosystems are approaching protective toxicity thresholds."

In humans, post-application exposure accounts for an estimated 90% of exposure, such as touching a counter or door knob after using a QAC-containing disinfectant and then touching your mouth. Quats are also found in household dust and air.

Health Hazards Associated With Quats

As detailed in the Environmental Science & Technology review, adverse health effects of QACs include:⁶

Allergic contact dermatitis

Asthma, chronic obstructive pulmonary disease (COPD), pulmonary cell damage and lung inflammation

Increased concentrations of inflammatory cytokines

Suppressed immune function

Reduced fertility in both sexes – In female mice, adverse outcomes include increased time between estrus cycles, reduced ovulation and implantation, and increased postimplantation losses. Male outcomes include decreased sperm concentration and motility.

Other animal research has demonstrated that QACs have embryocidal, ovidal and spermicidal activity when administered through the diet – so much so, a 1975 patent details the use of QACs "for the control of fertility"

Impaired embryo development and neural tube defects (regardless of which parent is exposed)

Developmental disorders resulting from alterations in cholesterol biosynthesis

Mitochondrial dysfunction – As noted by the authors of the review, "Chemically, most QACs can be classified as lipophilic cations that can accumulate into a negatively charged mitochondrial matrix. Evidence of direct inhibition of mitochondrial oxidative phosphorylation comes from multiple in vitro studies involving several QACs"

Increased risk of antimicrobial resistant infections

Considering the hazards, I strongly recommend ditching all antimicrobial products containing triclosan or QACs. Warm water and a mild soap is all you need to scrub

germs off your hands. Even the FDA admits "there isn't enough science to show that over-the-counter (OTC) antibacterial soaps are better at preventing illness than washing with plain soap and water."⁷

The same goes for eliminating harmful microorganisms from household surfaces. Common household items such as hydrogen peroxide, white vinegar and essential oils can actually do the job better than chemicals.

Proper Hand Washing Technique

Hand washing is a simple way to reduce your exposure to potentially disease-causing germs and reduce your chances of getting sick. While not the only factor, it can drastically reduce the germs that get access to your body, especially when you do it at key times, such as before eating or touching your mouth, eyes and nose, and after using the restroom or visiting public areas.

Hand washing needs to be done correctly, however, in order to be truly effective for disease control. Simply rinsing your hands with water, or giving a quick scrub with soap, is not enough to remove germs. So, to make sure you're actually removing the germs when you wash your hands, follow these guidelines:

1. Use warm, running water and a mild soap
2. Work up a good lather, all the way up to your wrists, scrubbing for at least 15 or 20 seconds
3. Make sure you cover all surfaces, including the backs of your hands, wrists, between your fingers and around and below your fingernails
4. Rinse thoroughly under running water
5. In public places, use a paper towel to open the door as a protection from germs that the handles may harbor

Keep in mind that your skin is your primary barrier against germs, so obsessive-compulsive washing, especially in dry environments that typically exist for most in the

winter months when the heat is on, can actually increase your risk of getting sick by drying out your skin. So keep a balance. Avoid washing your hands to the point of irritating your skin, as dry, cracked areas are a perfect entryway for germs.

Regular Soap Is Most Effective Against Viruses Too

Keep in mind that, like antibiotics, antibacterial soap only affects bacteria, so antibacterial soaps cannot protect you against viruses. Even for bacteria, research has demonstrated that antibacterial soap provides no additional benefit over nonantibacterial soap. As noted in a 2007 systematic review⁸ published in the journal *Clinical Infectious Diseases*:

"The lack of an additional health benefit associated with the use of triclosan-containing consumer soaps over regular soap, coupled with laboratory data demonstrating a potential risk of selecting for drug resistance, warrants further evaluation by governmental regulators regarding antibacterial product claims and advertising."

The good news is, regular soap DOES kill viruses. As detailed in a series of Twitter posts⁹ by professor Pall Thordarson¹⁰ — who specializes in biomimetic, supramolecular and biophysical chemistry and nanomedicine — soap very effectively kills most viruses, including SARS-CoV-2.

The reason for this is because the weakest link in the virus is its lipid (fatty) bilayer. Soap dissolves this fat membrane, causing the virus to fall apart, thus rendering it harmless. Not even alcohol is as effective for inactivating viruses, although it may be more practical for using surfaces other than your hands and body.

Soap Mechanics 101

A soap molecule is suited for mixing oil and water as it shares qualities of each. Soap molecules are amphipathic,¹¹ meaning they have both polar and nonpolar properties,

giving them the ability to dissolve most kinds of molecules. As explained by Thordarson, soap basically dissolves the "glue" that holds the virus together.

The alkalinity of soap also creates an electric charge that makes the soap hydrophilic (water-loving).¹² Hydrogen atoms in water molecules have a slightly positive charge, so when you wet your hands and then use soap, this molecule will readily bond with the nearest water molecule. Hence, when you wash your hands under running water, the now deconstructed virus is easily washed away. The New York Times explains the process this way:¹³

"When you wash your hands with soap and water, you surround any microorganisms on your skin with soap molecules. The hydrophobic tails of the free-floating soap molecules attempt to evade water; in the process, they wedge themselves into the lipid envelopes of certain microbes and viruses, prying them apart.

'They act like crowbars and destabilize the whole system,' said Prof. Pall Thordarson, acting head of chemistry at the University of New South Wales. Essential proteins spill from the ruptured membranes into the surrounding water, killing the bacteria and rendering the viruses useless."

Keeping Your Home Clean, Safely

The surfaces of your home can also be kept clean and free of bacteria without the use of harmful chemicals. An all-purpose cleanser that works great for kitchen counters, cutting boards and bathrooms is 3% hydrogen peroxide and vinegar. Simply put each liquid into a separate spray bottle, then spray the surface with one, followed by the other. It doesn't matter which is used first.

In tests run at Virginia Polytechnic Institute and State University, pairing the two mists (one after the other) killed virtually all Salmonella, Shigella, and E. coli bacteria on heavily contaminated food and surfaces when used in this fashion,¹⁴ making this spray

combination more effective at killing these harmful bacteria than chlorine bleach or any commercially available kitchen cleaner.

This combo can also be used to cleanse fresh produce.¹⁵ Do not mix the two in the same sprayer bottle, as the resulting chemical, peracetic acid, has a different set of properties.¹⁶

“Eliminating 'antibacterial' products from your home is a simple way to protect your family's health by reducing your toxic burden. And since there's no effectiveness advantage to these products, the only thing you're giving up are the risks associated with them.”

Other safe substances that can be used to disinfect your home include:

- **Coconut oil**, which has potent disinfectant properties, can be used to disinfect wooden cutting boards and other wood surfaces.
- **Sunlight** — Drying your laundry in the sun is one of the best ways to save energy and wind up with fresh, clean linens and clothing.
- **Oregano oil**, which has been shown to kill bacteria responsible for food poisoning, cold viruses and microbial spores.

A study¹⁷ in the international journal Food Science and Technology formerly known as Lebensmittel-Wissenschaft & Technologie (LWT) — found oregano oil performed more effectively than sodium hypochlorite, a conventional means of removing bacteria from stainless steel surfaces used in the food industry. And, unlike sodium hypochlorite, oregano oil does not cause corrosive damage to surfaces.

Homemade House Cleaning Products

Including oregano essential oil in your homemade cleaning products is a simple, easy and effective means of killing pathogens. Below are two recipes for cleaning products you can make at home with ingredients you may already have in your kitchen cabinet.

For an all-purpose cleaner, mix 1 cup of water, 2 teaspoons of castile soap and 20 drops of oregano essential oil in a spray bottle, preferably made of glass. Shake well before each use and store in a cool, dark place, as essential oils oxidize when exposed to heat and sunlight.

Alternatively, combine four drops of oregano oil with 10 drops of lemon oil and a quarter-cup of white vinegar.¹⁸ Add this mixture to a bucket of warm water and use to wipe and clean surfaces.

Again, eliminating "antibacterial" products from your home is a simple way to protect your family's health by reducing your toxic burden. And since there's no effectiveness advantage to these products, the only thing you're giving up are the risks associated with them.

Sources and References

- ¹ [Aquatic Toxicology 2006 Dec 1;80\(3\):217-27](#)
- ^{2, 3} [J Toxicol Environ Health B Crit Rev September 6, 2018; 20\(8\): 447-469](#)
- ⁴ [Environmental Science and Technology 2014 Aug 5;48\(15\):8831-8](#)
- ^{5, 6} [Environmental Science & Technology 2023; 57: 7645-7665](#)
- ⁷ [FDA.gov Antibacterial Soap Consumer Update](#)
- ⁸ [Clin Infect Dis. 2007 Sep 1;45 Suppl 2:S137-47](#)
- ⁹ [Twitter Palli Thordarson March 8, 2020](#)
- ¹⁰ [UNSW School of Chemistry, Pall Thordarson](#)
- ¹¹ [Harvard University, January 9, 2017](#)
- ¹² [Washington Post, March 20, 2017](#)
- ¹³ [New York Times March 13, 2020](#)
- ^{14, 16} [Tau Topics Disinfection](#)
- ¹⁵ [Cooks Info Peroxide and Vinegar Sterilization for Veggies](#)
- ¹⁷ [LWT July 2018; 93: 293-299](#)
- ¹⁸ [Janella Purcell Antiseptic Cleanser](#)