



The Truth About Bleach

Get the real story on the most widely available,
affordable disinfectant on earth

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The Truth About Bleach

There's a lot of confusion about Clorox® regular bleach. A versatile disinfectant with a simple and sustainable chemistry, bleach has been used for generations during times of great public health crises and for everyday tasks at home.

In spite of this long history, some people believe bleach is dangerous or detrimental to the environment. The truth is, when used as directed, bleach is neither. In fact, it's the most widely available, affordable disinfectant on earth, with a wide variety of uses that range from helping save frog populations to cleaning up spacecraft upon their return to earth.

Read on for the *truth* about bleach.

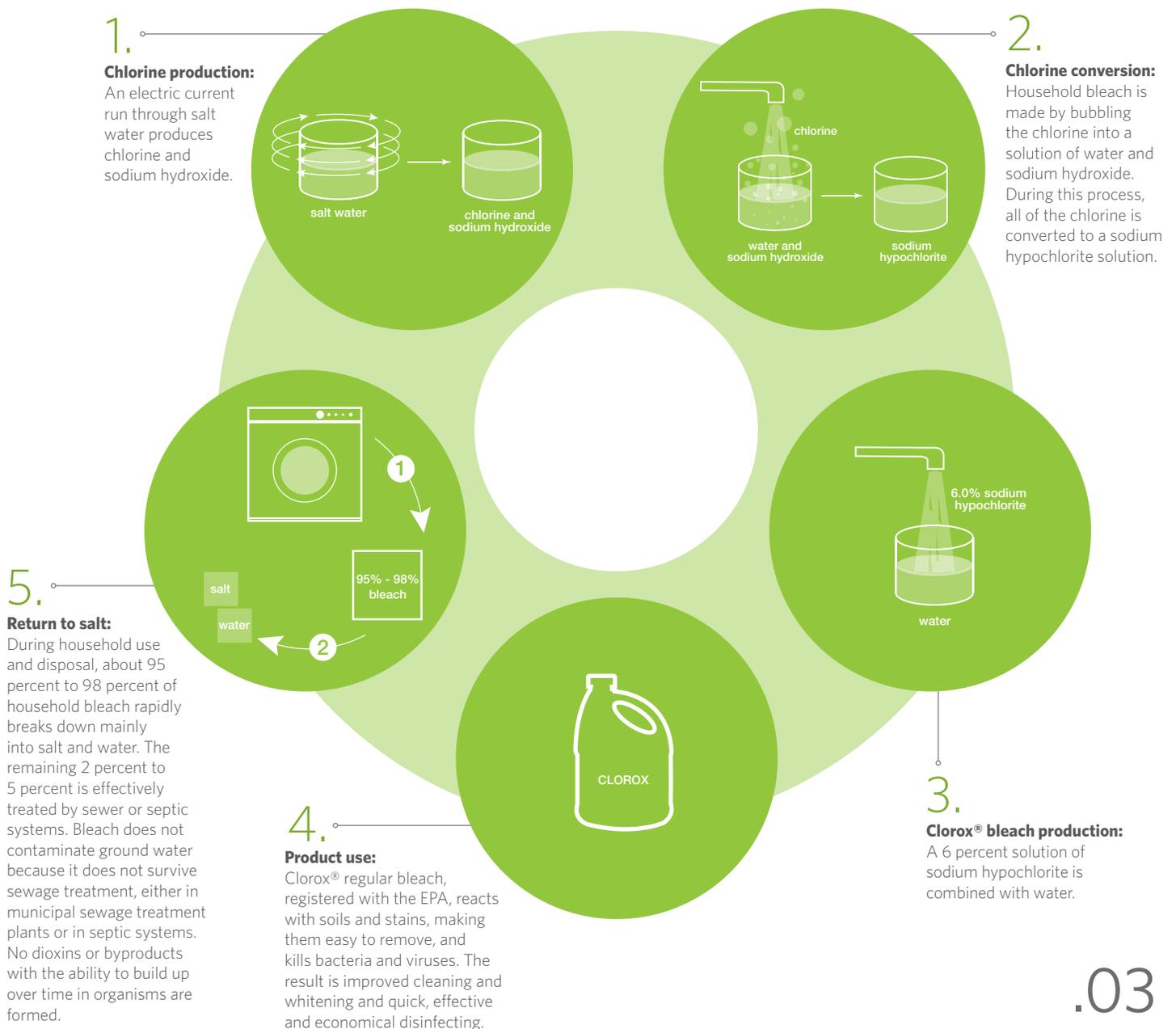
Clorox® Bleach: Salt of the Earth

If clean has a smell, it's the iconic scent of bleach. Its barely detectable aroma announces a towel is ready to use. Its trace on a white robe offers assurance you can wrap yourself in.

With so much power in one bottle of bleach, some assume it may be harmful to the environment. But the simple fact is this: Household bleach contains no free chlorine. It starts as salt water and breaks down mainly into salt and water during or quickly after use.

The Clorox® bleach cycle is sustainable

The household bleach cycle — from production to use to environmental fate — is simple and sustainable. We call it the salt-to-salt cycle. Here are the five steps:



The Most Widely Available, Affordable Disinfectant on Earth

From routine household tasks to dramatic disaster-recovery efforts, bleach is one of the world's most proven and trusted products.

The power of bleach goes far beyond whitening. Since its introduction in 1913, Clorox® brand disinfecting bleach has had a long history of use in places where killing germs is critical: in hospitals, nursing homes, child-care centers and restaurants. In fact, liquid bleach is the most widely available, affordable disinfectant on Earth.

Bygone bleaches were expensive or unstable

1913 marked the birth date of Clorox® bleach, but bleach itself wasn't a new concept at the time. As early as 300 B.C., ancient civilizations burned seaweed to clean and whiten cloth. During the Middle Ages, the Dutch perfected a technique that used sunlight to whiten fabric, but it was an arduous process, requiring large pieces of valuable land.

Then, in the late 18th century, scientists discovered chlorine and found it could produce better bleaching results in far less time. Of course, they soon realized the safety precautions necessary when working with pure chlorine gas. So in 1792, a French scientist added chlorine to a solution of potash, and the first commercial bleaching agent was born.

A few years later, a Scottish chemist substituted limestone for potash to make a bleach powder. During the Industrial Revolution, this patented product was widely used to whiten fabrics and paper products. However, the powder was chemically unstable and still quite expensive. The search for a quick-acting, user-friendly and economical bleach continued.





Sodium hypochlorite makes a better bleach

During the **early 1800s**, European chemists demonstrated they could create a superior type of bleach, sodium hypochlorite, by running an electric current through salt water, a process called electrolysis. Sodium hypochlorite — the active ingredient in today's Clorox® bleach — was the purest bleaching compound yet, with the fewest side effects. But at the time, electricity was too expensive for manufacturers to produce the compound on a mass scale.

Fast forward to **1913**, when five investors in Northern California shrewdly concluded that conditions were ripe for a sodium hypochlorite bleach business to succeed. In addition to its well-established ability to whiten textiles, French scientist Louis Pasteur had discovered bleach's unsurpassed effectiveness as a disinfectant, creating high demand for it across U.S. industry. Plus, inexpensive electricity was now becoming widely available. And the salt ponds of the San Francisco Bay provided plenty of brine — highly concentrated salt water — from which bleach could be created.

So the men invested \$100 apiece to start the venture, which would go on to become The Clorox Company. The original product contained more sodium hypochlorite than today's Clorox® regular bleach, and their first customers were laundries, breweries, walnut processing sheds and municipal water companies.

Years later, the company would zero in on the less-concentrated household bleach that remains today. Thus, after years of scientific research and innovation, it was Clorox that finally succeeded in producing a household bleach for the masses. And today, around the world, homes are cleaner and healthier because of it.

Disinfecting from the battlefield to outer space

Bleach's contribution extends far beyond its household uses; it also offers significant public-health benefits.

During **World War I** — in the days before penicillin — the lives of some wounded soldiers were saved by the antibacterial properties of bleach. During **World War II**, people continued to use bleach to destroy bacteria. Today, bleach is recommended for use during emergencies to disinfect water and to help control contamination. This even applies in space: In **1969**, the Apollo space capsule was disinfected with bleach upon its return to Earth.



Since the company's inception, Clorox has regularly responded to appeals for donations of bleach during times of natural disaster. And bleach is the trusted disinfectant of choice in the battle against cross-contamination on surfaces in hospitals.

Saving lives every day

Bleach's most enduring role is the one it plays every day: protecting families by killing viruses and bacteria like MRSA, Salmonella and E. coli on surfaces where they can spread.

Confidence in the efficacy and impact of disinfecting bleach is why the world's leading public-health agencies — the World Health Organization and the Centers for Disease Control and Prevention — recommend the use of bleach for helping control the spread of pathogens that can cause infections and other health threats.

This is particularly true for our most vulnerable populations. The School Food Safety Network recommends the use of bleach for food-contact surface preparation areas to help reduce the potential for cross-contamination of food and the spread of Salmonella, E. coli and other bacteria that can make kids sick. And Clorox has partnered with the Association of Professionals in Infection Control on "Protect Our Patients," a program to raise awareness among hospital staff, patients and families about how they can help protect patients from exposure to the bacteria that cause hospital-acquired infections, which kill an estimated 99,000 people in the U.S. every year.

Bleach:

One Product, Many Uses

Household bleach has a long history as the go-to solution for a variety of tasks, including some that may surprise you.

Central to bleach's appeal is its ability to work effectively for many uses — so much so, it can be a little overwhelming for the novice user. On these pages, we take the guesswork out of the use of disinfecting bleach and provide some innovative ideas for using it inside and outside the home.

You Probably Know About These Uses...

Remove mildew stains

You can use a Clorox® regular bleach solution to remove tough mildew stains. Here's how:

1. Mix 1 cup of Clorox® regular bleach per gallon of water.
2. Wash, wipe or rinse items with water.
3. Apply bleach solution.
4. Let stand for five minutes.
5. Rinse thoroughly and air dry.



Clean your toilets

Using Clorox® regular bleach is a simple way to clean and disinfect toilets. Here's how:

1. Flush toilet.
2. Pour 1 cup of Clorox® regular bleach into bowl.
3. Brush entire bowl including rim with a scrub brush or mop.
4. Let stand for 10 minutes.
5. Flush again.

And of course, Clorox® regular bleach remains a simple solution for general disinfecting and laundry needs

General Disinfecting: Bleach can be used to disinfect hard, nonporous surfaces to kill viruses that can cause colds and flu, and bacteria that can cause staph infections and strep throat. Refer to the Clorox® regular bleach label for detailed instructions for this type of use.

Laundry: Clorox® regular bleach has been trusted for generations for its ability to whiten fabrics while removing body soil, stains and odors that detergent can leave behind. Running a load of whites with bleach can also help sanitize your washing machine. Refer to the Clorox® regular bleach label for detailed instructions for this type of use.

IMPORTANT INFORMATION:

- Do not use Clorox® regular bleach full strength for cleaning surfaces.
- Always dilute strictly in accordance with label directions.
- Wear gloves when cleaning for prolonged periods.

Bleach solutions need to be made fresh daily. Once diluted, bleach breaks down quickly, mainly into salt and water (see page 3 for an overview of this process). Many spray bottles contain metal parts in the spray trigger; bleach will corrode these parts over time. When using bleach products, always read and follow precautions and usage directions. For more information on Clorox® regular bleach and its many uses, visit www.clorox.com.

Sanitize plastic cutting boards

You can use Clorox® regular bleach to sanitize hard, nonporous kitchen surfaces like cutting boards. Here's how:

1. Wash cutting boards with hot water and soap, using a scrub brush.
2. Apply a solution of 1 tablespoon Clorox® regular bleach to 1 gallon of water.
3. Let stand for at least two minutes.
4. Air dry.



Deodorize and sanitize kitchen cloths

Synthetic kitchen cloths can produce strong odors, not to mention the fact that they carry bacteria. Keep them sanitized and clean your sink at the same time. Here's how:

1. Fill your sink with 1 gallon of water.
2. Add $\frac{3}{4}$ cup of Clorox® regular bleach to water in sink.
3. Soak kitchen cloths in solution for at least five minutes.
4. Rinse sink and cloths, and air dry.

...But How About These?

Disinfect water

If you ever find yourself in a situation where the water supply is jeopardized and you are unable to boil water for five minutes, you can create potable water by using bleach. Here's how:

1. Before adding Clorox® regular bleach, remove all suspended material in the water by filtration or by allowing it to settle to the bottom.
2. Decant the clarified contaminated water to a clean container and add 8 drops of Clorox® regular bleach to 1 gallon of water (2 drops to 1 quart).
3. Allow the treated water to stand for 30 minutes. Properly treated water should have a slight chlorine odor. If not, repeat dosage and allow the water to stand an additional 15 minutes.
4. The treated water can then be made palatable by pouring it between clean containers several times.



Disinfect kids' toys

When sharing toys, children are often sharing bacteria and viruses. You can disinfect hard plastic toys using a solution of Clorox® regular bleach. Here's how:

1. Wash, wipe or rinse toys with water.
2. Soak in a solution of $\frac{3}{4}$ cup Clorox® regular bleach per gallon of water for five minutes.
3. Rinse thoroughly and air dry.



Keep cut flowers fresh longer

Clorox® regular bleach helps keep your flowers beautiful longer. And when the flowers are gone, it can help your vases sparkle. Here's how:

For use with fresh flowers:

1. Add $\frac{1}{4}$ teaspoon of Clorox® regular bleach to each quart of cold water.
2. Add flowers.

To keep flower vases clean and odorless:

1. Wash your vase thoroughly.
2. Mix a solution of $\frac{3}{4}$ cup Clorox® regular bleach to one gallon water.
3. Fill the vase with the bleach solution and let stand for five minutes.
4. Rinse and air dry.

Sanitize your pet's food and water bowls

Your pet's food and water bowls can be a breeding ground for bacteria. Sanitize them by using Clorox® regular bleach. Here's how:

1. Wash bowls with detergent and rinse.
2. Mix a solution of 1 tablespoon Clorox® regular bleach per gallon of water.
3. Fill bowls with bleach solution.
4. Let stand for two minutes.
5. Drain and air dry.

Benevolent Bleach

A sampling of the many ways
Clorox® regular bleach is making a difference

Helping to Reduce the Spread of MRSA

When kids play in their school gymnasiums, there may be an unexpected threat lurking: MRSA. Methicillin-resistant *Staphylococcus aureus* — a.k.a. MRSA — is a potentially life-threatening, antibiotic-resistant staph infection caused by bacteria that is becoming increasingly common in places like locker rooms, gyms and schools. It affects more than 90,000 Americans every year.

Fortunately, there are ways to help reduce the spread of MRSA. One important step is to use a product like Clorox® regular bleach to disinfect commonly touched surfaces.

To help educate communities about practical things they can do to help defeat MRSA, Clorox has joined seven-time NBA all-star Grant Hill — who himself has experienced an MRSA infection — along with community members and MRSA experts to launch the Stop MRSA Now coalition.

The coalition is taking an active role in helping prevent the spread of MRSA by providing educational materials to communities, distributing a national public service announcement and offering online resources at stopmrsanow.org. Clorox is honored to support the Stop MRSA Now coalition to underscore the importance of understanding the issue of MRSA and how to help prevent its spread.



Lending a Hand to a Tornado-Ravaged Town

Clorox is supporting the effort to rebuild Greensburg, Kan., a town destroyed by one of the worst tornadoes in U.S. history. In homage to its name, Greensburg is rebuilding green; its goal is to become one of the most environmentally sustainable cities in the country.

Clorox is lending a hand by donating bleach to every family in Greensburg. Since bleach quickly breaks down to mostly salt and water (see more about this cycle on page 3), it's an important part of any sustainable community.

Clorox is also donating \$500,000 toward rebuilding the Greensburg school's locker room and gym, which, as with the rest of the school, will be rebuilt to LEED (Leadership in Energy and Environmental Design, a green-building rating system) platinum-level sustainability standards.



Fighting the Deadly Frog Fungus



Clorox has joined forces with TV station Animal Planet on a multimedia project called *The Vanishing Frog* to focus attention on a deadly fungus that is destroying frogs and other amphibian populations around the world.

Frogs and their relatives have thrived on Earth for more than 360 million years, but now they're under serious threat. From the rocky streams of coastal Australia to the jungles of South America and even the American West, the world's frogs are mysteriously vanishing at alarming rates. Experts believe that as many as one-third to one-half of the planet's 6,000 amphibian species are in danger of disappearing, one of the most significant mass extinctions since the dinosaurs.

Why are amphibians in such dire straits? And how can we reverse this course? Right now, the only hope of saving frogs is to rescue them by capturing them in the wild and taking them into protective custody. Once the frogs have been captured, Clorox® regular bleach is one of the most important tools in the fight to save them. They're treated with anti-fungal medicine, while anything else that was in contact with water during the rescue is treated with a bleach solution to ensure researchers aren't spreading the fungus to new, uncontaminated areas.

Marjorie Kaplan, president and general manager of Animal Planet, said, "We're thrilled that our partner Clorox has been an ardent advocate for the amphibian crisis and is taking that commitment even further by partnering with us to produce *The Vanishing Frog* documentary project."

Protecting California's Oaks

Say, "California," and most people think palm trees. But for generations of Californians, it isn't the palm-tree postcard of Hollywood they imagine when they think of their beloved landscape. It's the outline — sweeping, broad and majestic — of the native California oaks that once covered the state.

But today, it's hard to find an oak in downtown Oakland, home of The Clorox Company and California Oak Foundation. That's because increasing population and development pressures are threatening oak sustainability. So is a plant disease known as Sudden Oak Death, which can result when a pathogen called *phytophthora ramorum* contaminates the water supply of oak woodlands. The California Department of Forestry is using bleach to help stop the spread of the disease. For more information, visit californiaoaks.org.

As part of its commitment to protecting the oak population, Clorox is funding a program aimed at helping tree-planting groups and teaching middle-school children about the threats to the oak population. The curriculum will bring the story of the oaks to 4,000 schools throughout the state.

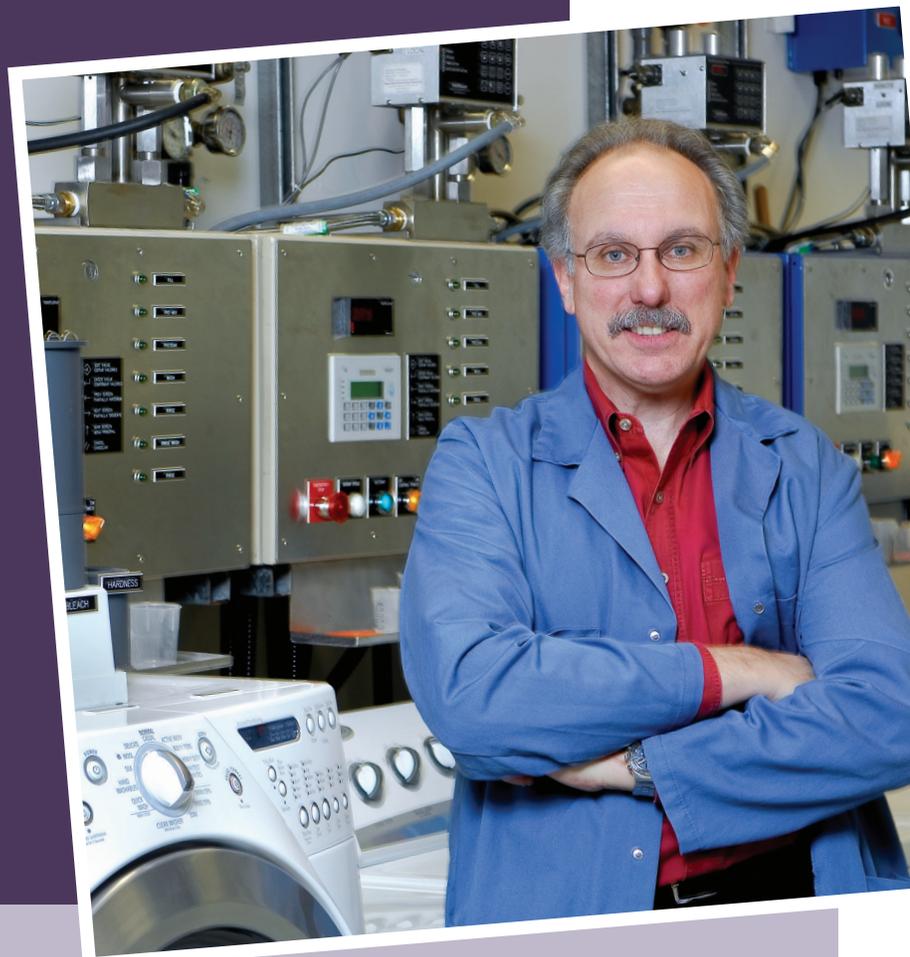


Getting to the Bottom of the Bleach Brouhaha

Myths abound about bleach. Do you know the truth?

It's inevitable: A product as versatile as Clorox® bleach is bound to run up against some misunderstanding through the years. We talked to a top company scientist, Greg van Buskirk, to help separate fact from fiction when it comes to this timeless solution.

Greg van Buskirk is a research fellow at The Clorox Company, where he has worked for 28 years. A chemistry graduate of the University of California, Berkeley, Greg achieved his doctorate under Herb Kaesz, Ph.D., of the University of California, Los Angeles. Greg has worked for Clorox his entire professional life, including two years as an exchange scientist in Germany with the company's former partner, Henkel KGaA. His areas of responsibility have included research and product development for laundry, home care and general technology areas.



Greg van Buskirk, research fellow at The Clorox Company

Does the use or manufacturing of Clorox® bleach create dioxins?

No. Studies have shown that dioxins are not produced when sodium hypochlorite bleach is manufactured or used in laundry or for household cleaning.

Are chlorine and liquid bleach one and the same?

Actually, they are not. The term “chlorine bleach” is a misnomer. What’s in the bottle is sodium hypochlorite, the active ingredient in liquid bleach. Although chlorine is used to manufacture sodium hypochlorite, there is no free chlorine in bleach.

I’d like to use bleach on my whites, but many of my garment labels say not to.

It’s surprising how many things are labeled “do not bleach,” when in fact almost all cotton whites and most synthetic whites are safe to treat with liquid bleach. If a label on your whites instructs not to use bleach, test it out on a hidden area. (A “bleachability” test can be found on the back label or on drlaundryblog.com.) **If there is no visible effect, it can be bleached.** This is also true for many printed and colored fabrics.

Does Clorox® bleach contaminate groundwater?

No. Household use of bleach doesn't contaminate groundwater. The active ingredient, sodium hypochlorite, rapidly degrades. It works promptly against stains and dirt and then quickly breaks down, primarily into salt and water (see page 3 for further detail). Household water is then directed to a septic tank or sewage treatment plant.

I'm trying to make "green" changes in my household. Should I get rid of bleach?

Bleach does not harm the environment. Household bleach starts as salt water and breaks down mainly into salt and water during or quickly after use. There's a significant difference between "bleaching" — the term often associated with the manufacturing of paper products — and household bleach. The fact is, during consumer use and disposal, about 95 percent to 98 percent of household bleach quickly breaks down; the remaining 2 percent to 5 percent is effectively treated by sewer or septic systems. Bleach does not contaminate ground water because it doesn't survive sewage treatment, either in municipal sewage treatment plants or in septic systems.

Does bleach wear down fabric and shorten its lifespan?

No. When used as directed, bleach does not affect the life of fabric. Tests show that even after 50 wash cycles, fabric washed in laundry detergent with Clorox® regular bleach is just as resilient as fabric washed in laundry detergent alone.

Is there mercury in Clorox® regular bleach?

When we did our last major round of testing in 2001, which included all seven of our U.S. facilities, **we found no detectable level of mercury in our final bleach product.** The detection limit is less than 0.2 parts per billion.

To put that into perspective, federal rules allow drinking water to contain 2 parts per billion of mercury, or at least 10 times more than the detection limit. Moreover, federal rules consider mercury hazardous waste at 200 parts per billion. In other words, by not finding any mercury at its detection limit, our bleach is at least a thousand times below the level of being considered a hazardous waste due to mercury.

Bleach is mostly water. So if any mercury were to show up in our bleach, it would likely be coming from the water — the same water you and I drink. But again, our tests showed that the levels of mercury in Clorox® regular bleach were not even detectable, well below the federal limits for drinking water.

Isn't bleach a leading source of poisoning deaths among household cleaners?

No. This is not true. According to the American Association of Poison Control Centers (AAPCC), the percentage of serious incidents from household bleach is far lower than that of other cleaners. In fact, according to AAPCC data from the most recent year available, the ratio of exposures to serious incidents for bleach is the same as reported for household plants.

Why Is Bleach Misunderstood?

We suspect there are two reasons for confusion about bleach. The first and likely the most significant is public concern about chlorine. Even though bleach has an entirely different chemistry — it is derived from common salt and there is no free chlorine in the final product (see page 3 for more on this) — bleach is commonly referred to as chlorine bleach. So the concerns about chlorine have extended to household bleach.

Second, concern may stem from the language related to the registration of bleach. Some bleach products are EPA-registered disinfectants, which means, because they kill germs, they're classified as pesticides, along with agricultural pesticides, even though their use is primarily that of a public health disinfectant. This can be confusing because of negative public perceptions relating to the term "pesticide." Clorox is working to educate the public regarding the differences between traditional agricultural pesticides and public health disinfectants.

Test Your Bleach Smarts

Do you know the truth about bleach? Take our quiz and find out.

- .01** In what year was Clorox® regular bleach introduced?
- a. 1914
 - b. 1972
 - c. 1913
 - d. 1883
- .02** True or false: Clorox® regular bleach does *not* contaminate groundwater.
- a. True
 - b. False
- .03** What is the correct ratio for making a disinfecting bleach solution (for hard, nonporous surfaces) at home?
- a. $\frac{3}{4}$ cup Clorox® regular bleach per gallon of water
 - b. 1 teaspoon Clorox® regular bleach per pint of water
 - c. 3 tablespoons Clorox® regular bleach per gallon of water
 - d. 1 cup Clorox® regular bleach per 2 cups water
- .04** Which prominent public health agencies recommend the use of bleach for controlling the spread of pathogens that can cause infections and other health threats? (Select two.)
- a. The Ministry of Global Health
 - b. The World Health Organization
 - c. The Centers for Disease Control and Prevention
 - d. The Department of Housing and Urban Development
- .05** Which type of bacterial infection is Clorox helping to fight through a coalition of community members and medical experts?
- a. Pneumonia
 - b. Strep throat
 - c. MRSA
 - d. Lyme disease
- .06** True or false: Clorox® regular bleach can be used to disinfect water in situations where the water supply has been jeopardized.
- a. True
 - b. False
- .07** What happens to Clorox® regular bleach after household use, when disposed of down the drain?
- a. The active ingredient, sodium hypochlorite, is removed during the wastewater treatment process.
 - b. It rapidly breaks down into mostly salt and water.
 - c. It is recycled and made into new bleach.
 - d. It is deposited into groundwater.
- .08** What creature is Clorox® regular bleach helping to save in the fight against a deadly fungus?
- a. Butterflies
 - b. Dogs
 - c. Frogs
 - d. Jellyfish
- .09** True or false: Chlorine and liquid bleach are one and the same.
- a. True
 - b. False
- .10** Which scientist was a pioneer in the use of sodium hypochlorite?
- a. Marie Curie
 - b. Louis Pasteur
 - c. Jonas Salk
 - d. Linus Pauling

Answers: 1) c, 2) a, 3) a, 4) b and c, 5) c, 6) a, 7) b, 8) c, 9) b, 10) b



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