Why Shocking a Residential Well Isn't Necessarily the Right Solution

When a well owner receives a positive result on a microbial test, their first question is typically, "Now what?" To help customers address their water contamination issues, water treatment professionals often recommend shock chlorination—the process by which high levels of an oxidant, usually household bleach, are introduced into the water source and plumbing system for a temporary period of time.

Similar to what pool owners do when their swimming pools turn cloudy, shock chlorination is intended to destroy the microorganisms that could cause disease. The process is inexpensive, fast, and conducted as needed.

While this corrective practice is quite common, it's not necessarily the best approach for treating residential wells. This white paper explains why and provides a best-practice solution that can protect well owners from microbial contamination going forward.

A complex process

Chlorine only inactivates the microorganisms in the water that it's been in contact with for the correct amount of time. Therefore, it's important to determine the ideal amount of chlorine and correct contact time for the process to work.

Identifying the amount of chlorine depends on multiple factors, including the depth of the well, pH of the water, and the presence of slime or biofilm. Created when bacteria attach to well casings and grow, biofilms can impede chlorine's effectiveness. Depending on how much biofilm exists, the well may need to be scrubbed before shock chlorination can take place.

Additionally, other water contaminants, including organic matter, ferrous iron, and manganese, can impact the efficacy of chlorine. Oxidants, like chlorine, will oxidize the least resistant contaminants first. That means the chlorine could easily get used up oxidizing any organics (e.g., tannins, iron, manganese) in the water instead of the targeted microbes. To compensate, more chlorine is needed to treat the water, which increases the likelihood disinfection byproducts will form.

Following shock chlorination, the water should be tested again one to two weeks later to make sure bacteria is no longer present. Should this test come back positive, additional shocks of the well are necessary until a negative result is achieved.

Microorganisms can only be inactived by chlorine if if they're exposed to it for the correct amount of time. And times can vary due to a variety of factors.

Inconsistencies in treatment protocols

Quality of private well water is not regulated by the government; it's solely the responsibility of the well owner. And far too often, well owners either don't realize this or don't know what that truly means. Unfortunately, when it comes to figuring out next steps concerning positive bacterial tests and shock chlorination, guidance can be inconsistent, misleading, and downright confusing—for well owners and the water treatment professionals advising them.

Organizations like the U.S. Environmental Protection Agency, Centers for Disease Control, Health Canada, American Water Works Association, and National Ground Water Association all have different recommendations for treating well water with shock chlorination. With no single view of the truth, protocols differ vastly by treatment provider, region, state, and country—resulting in varying degrees of efficacy.

For example, the National Collaborating Centre for Environmental Health[1] reviewed guidelines for shock chlorination in private wells and found that there are no established standards for chlorine concentrations or doses. Furthermore, required contact times varied substantially from 8 to 48 hours, though the mean minimum time is 12 hours.

An additional study by researchers in the U.S. found similar inconsistencies in emergency well treatment protocols, specifically as it relates to flushing systems following shock chlorination and post-shock testing.[2]

Drawbacks to shock chlorination

It's a short-term solution.

Shocking or super chlorinating a water source does inactivate microorganisms, but it's far from a permanent fix. In a survey of rural wells in Pennsylvania, researchers found that shock chlorination suppressed *E. coli* for just one to two months in wells that had been previously contaminated.[3] Another study, this one of wells in Alberta, Canada, discovered that coliform colonies reappeared anywhere from 1 to 21 weeks following a shock chlorination.[4] These findings offer further proof that a clear total coliform test following shock chlorination doesn't mean a well owner is in the clear.

Once a well has been contaminated, it's highly likely that it will become contaminated again. If the source of the problem hasn't been identified or fixed, risk of contamination still exists.

[1] Angela J. Eykelbosh. "Review of Guidelines for Shock Chlorination in Private Wells." National Collaborating Centre for Environmental Health, November 2013.

[2] Kelsey J. Pieper, William J. Rhoads, Leslie Saucier, Adrienne Katner, Jason R. Barrett, and Marc Edwards. "Improving state-level emergency well disinfection strategies in the United States." Science of the Total Environment, February 20, 2020.

[3] Bryan R. Swistock and William E. Sharpe. "The influence of well construction on bacterial contamination of private water wells in Pennsylvania." Journal of Environmental Health Sciences, September 2005.

[4] J.A. Oliphant, M.C. Ryan, A. Chu, and T.W. Lambert. "Efficacy of Annual Bacteria Monitoring and Shock Chlorination in Wells Finished in a Floodplain Aquifer." Groundwater Monitoring & Remediation, February 22, 2007.

It doesn't address seasonal changes.

Water quality changes from day to day, season to season—with snowmelt, heavy downpours, a leaking septic system, or changes in land use. Shock chlorination cannot prepare well owners for seasonal changes in coliform presence; positive coliform tests are more likely to occur in warmer months than in colder months.

When the ground is frozen, groundwater infiltration is reduced. Lab experiments have proven that growth of coliform bacteria does not occur below 7.8°C (46°F)[5]; while these bacteria are in a nonculturable state, they are still viable and could make people sick.

It can get expensive.

Monitoring the status of the well requires regular testing, but retesting becomes expensive and time consuming. Depending on test results, well owners will likely need to repeat the shock process on a somewhat regular basis as well.

It's a hassle.

Highly chlorinated water is not safe to drink, and for the shock to work, the chlorine must remain in the plumbing system for at least 12 hours. That means, prior to the shock, homeowners should store 12 to 24 hours' worth of water for drinking and cooking.

To ensure the efficacy of shock chlorination, chlorine must reach every point in the home's piping, including dishwashers, washing machines, and dead ends. Water treatment professionals should remove any plumbing that's no longer in use prior to the shock.

It can have negative impacts.

Chlorine is aggressive and can damage well casings and other parts of a water treatment system, including softeners, filters, and other treatment components. Additionally, introducing high levels of chlorine can reduce septic growth—killing the good bacteria that resides in septic systems—impacting performance.

It doesn't work on all microorganisms.

Chlorine cannot inactivate all microbial contaminants, as some, like *cryptosporidium* and *giardia*, are chlorine resistant.

It can generate disinfection byproducts.

As previously mentioned, chlorine will oxidize organic contaminants if they exist in the well water. Oxidation of organics can generate trihalomethanes (THMs) and halocetic acids—disinfection byproducts that can cause anemia and liver and kidney issues; affect the nervous system; and are linked to cancer. Some of these byproducts can vaporize and be absorbed through the skin during hot baths or showers.

[5] Thomas B. Atherholt, Nicholas A. Procopio, and Sandra M. Goodrow. "Seasonality of Coliform Bacteria Detection Rates in New Jersey Domestic Wells." Groundwater, May-June 2017.

The best-practice approach to well water treatment

Shocking a well is a logical first step after a positive bacteria test, but it's not a long-term solution for ongoing contamination issues. It's a quick fix that's best paired with long-term water treatment from an ultraviolet water treatment system.

Don't give your customers a false sense of security. The best possible way to protect your customers' water is through a comprehensive solution that combines well protection, maintenance, water monitoring, and continuous treatment from the point water enters the home.

A point-of-entry UV water treatment system delivers quality water to every tap in the house. Using UV light as a method of treatment adds nothing to the water and takes nothing away. As water passes by the UV light, microorganisms within the water are exposed to a lethal dose of energy, which destroys their DNA and inactivates their ability to reproduce and cause infection. There's no need to handle dangerous chemicals, no concerns about the creation of disinfection byproducts, and no likelihood of chemical corrosion. Plus, the water's taste and odor are preserved.

About VIQUA

VIQUA is proud to be one of the world's leading suppliers of residential and light commercial UV water treatment systems, providing treated water without the use of chemicals. Available as point-of-entry or point-of-use solutions, VIQUA UV systems inactivate common waterborne pathogens*—including *cryptosporidium, giardia, pathogenic E. coli (STEC/VTEC), campylobacter, legionella, salmonella, shigella, norovirus, enterovirus,* and *hepatitis A virus*—to continuously deliver on our promise: consistently better water.† For more information, visit www.viqua.com.

*Efficacy of VIQUA UV systems has been demonstrated in internal testing using surrogate organisms, specifically MS2 Phage. MS2 is a well-documented surrogate organism that is accepted in the water treatment industry in the design and testing of UV systems being used to treat *cryptosporidium* and *giardia*. Contact VIQUA for the details on internal testing performed.

† Versus identical incoming water that is not treated with a UV system. Based on internal efficacy testing, VIQUA UV treatment systems, when installed in accordance with the manufacturer's recommendations and with use of a VIQUA UV lamp that is within its expected life, and subject to mechanical and water quality variables, can inactivate common waterborne pathogens. Actual efficacy of any particular VIQUA UV system will be dependent upon mechanical and water quality variables, including incoming water quality, the specific pathogen(s) present, age of UV light bulb, etc. Accordingly, no guarantee can be provided of actual percentage of common waterborne pathogens inactivated in an application.

425 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1 • 1.800.265.7246 (US/CAN) • +31.73.747.0144 (EUR) • **VIQUA.com**

© Copyright 2024, Trojan Technologies Group ULC. VIQUA is a trademark of Trojan Technologies Group ULC. [04022024]