

Populations at Risk from Private Water Supplies

By Kelly A. Reynolds, MSPH, Ph.D.

Priate water supplies appear to be the final frontier in source water protection. With the *Safe Drinking Water Act* (and later amendments) and the newly promulgated *Groundwater Disinfection Rule*, standards mandate treatment and/or quality assessment of community and non-community drinking water sources. Government standards and guidelines, however, fail to address the problem of largely unmonitored and untreated source water that serves approximately 15 percent of the US population: private drinking water.

Defining risks

Private water supplies are defined as not being under the regulatory jurisdiction of the US EPA water quality standards of the *Safe Drinking Water Act*. Although testing services are available, most private water supplies are not routinely monitored, particularly in rural or unincorporated areas. Saying that these populations are 'at risk' suggests the possibility of an adverse impact but requires evaluation of the probability of said impact. Little information is available, however, regarding the frequency and duration of exposures to harmful contaminants in private water supplies or the probability of an adverse outcome due to that exposure. These uncertainties are difficult to define given that survey of private water supplies would require an extensive effort and typically serve a very small segment of the population.

Common groundwater contaminants include enteric microbes, lead, copper, radon, nitrate, pesticides, metals, volatile organic compounds and others. Outbreak data and monitoring articles support the concerns of contaminants in private groundwater supplies.

A full report from the US Geological Survey (USGS) related to survey information of groundwater contamination in the US is to be presented to Congress in March, while other reports of private well contamination abound. In 2006, volatile organic compounds (VOCs) were detected in groundwater and drinking-water supply wells throughout the US.¹ VOCs originate in a variety of products including gasoline, plastics, paints and adhesives. The USGS targeted 2,400 domestic wells and found 14 percent tested positive for VOCs. Only a few wells tested above the threshold level of 0.2 parts per billion but the presence of any level of VOCs suggests a vulnerability of the water source. At question is the level of exposure a family may endure over long periods of time due to variable contamination of their drinking water.

Human illness causing viruses, bacteria and protozoa have all been documented in groundwater sources. Under the *Groundwater Disinfection Rule*, waterborne illnesses due to viruses are expected to drop by more than 42,000 cases per year. Application of the

same type of quality standards to private wells would likely result in significant health improvements as well. Septic tanks are found in approximately one in five US households and have been associated with illnesses, increasing with decreasing septic tank distances from drinking water wells. One study showed that 46 percent of all drinking water wells were contaminated if the septic system was within 20 meters of the source.²

A survey of 50 private homeowner wells in America found enteric viruses in eight percent of samples collected.³ *Helicobacter pylori* in homeowner wells was linked to infections in the US and Germany, which included a survey of infected children drinking untreated water. Various studies have found 10-60 percent of individual groundwater wells to be contaminated with *H. pylori*.⁴ *H. pylori* is considered a Class 2 carcinogen since infections can lead to ulcers and advance to gastric cancer in some cases.

The latest waterborne disease surveillance report from the CDC reveals a continuing problem with individual water sources. During the surveillance period of 2005-2006, 28 waterborne disease outbreaks were documented in 14 states, resulting in 612 illnesses and four deaths.⁵ Of the outbreaks associated with drinking water, 25 percent were due to individual water systems and 87.5 percent due to a groundwater source.

Individual responsibility

The US EPA private well website (www.epa.gov/safewater/privatewells) stresses the need for proper well construction and suggests a minimum setback of 50 feet for septic tanks, livestock yards and leach fields; 100 feet for petroleum tanks, contained manure and fertilizer storage and 250 feet for manure stacks. Wells should also be positioned so that rainwater flows away from it. Snowmelt also contributes to contamination and is difficult to direct, thus deeper wells are preferred.

State environmental departments or natural resources offices, county extension offices and health departments are all effective resources for more information on water testing and groundwater resources. Generally it is recommended that wells be tested once a year, at a minimum, for coliform bacteria, nitrates, total dissolved solids and pH levels. Other contaminant testing is warranted if the site is subject to unique conditions such as close proximity to a chemical spill or livestock. While yearly testing is a practical schedule, the consumer may still be unprotected for long stretches of time when periodic contamination episodes can occur.

For municipal drinking water sources, efforts to control microbial contamination are focused at three primary sites for a combined, multi-barrier approach: 1) the source water, 2) the treatment plant and 3) the distribution system. For the individual well owner, the responsibility of the quality of the

water is a personal one. Although the CDC, US EPA, USGS and others provide a list of precautions and proactive approaches for protecting private source waters, monitoring wells and disinfecting when needed, they do not promote the use of highly effective POU/POE systems.

Gaining acceptance

Peter Censky, Executive Director of the Water Quality Association, recently responded to anticipated USGS reports of contaminated private wells stating, "...our [the POU/POE] industry provides the only solutions to treat water from residential wells. We will seek out ways to work with them [USGS] and the EPA to gain greater acceptance of our industry's technologies and Certified Water Specialists."⁶

The overwhelming benefit of POU water treatment at the household level in the developing world has been repeatedly established.⁷ In the US, the distinction is less clear given that the overall waterborne disease level is lower and the health endpoints less severe; however, the implication is present. With proper care and maintenance, POU devices can be expected to reduce exposures to a wide variety of water contaminants and offer peace of mind in situations where contamination peaks may occur, such as during a storm event where increased runoff is a concern.

Consumers are confused about POU treatment devices and the variety of choices in technology, efficiency and design. They may tend to select a device based on cost rather than addressing their particular water treatment needs. The National Sanitation Foundation (NSF) (www.nsf.org) provides a detailed summary of POU technologies and their application but such information is not easily found on US Government websites, other than for small system compliance issues related to arsenic. More transparent discussions are needed involving trusted government agencies and stakeholders in water treatment and consumption. Although the risks of private drinking water supplies are outside regulatory agencies' jurisdictions, this population should at least be provided with easy access to information to make an informed choice on the benefits of treatment options at the point of use.

References

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Comment by Lawrence R. Henke, Technical Review Committee

The water conditioning, POU/POE industry was driven by consumers' need for aesthetic improvement in water, specifically hardness, iron, taste and odor where the consequences of product failure were evident and annoying, but not dangerous. The industry focused on sales of product direct to the consumer, with no intervening and largely independent testing and verification. As such the industry growth encompassed a product delivery system that was (and remains) largely unregulated. To move from this culture into one where health problems are addressed, such as in the private well market, requires systemic change in the mindset and in the culture of the industry. The private well market remains one of the few where health concerns and product selection is fully the responsibility of the consumer with the help of the dealer.

The change to public health can be facilitated by the organizations within the industry such as the WQA, NSF International or UL or imposed from outside through federal, state and local public health bodies such as the US EPA and state and local health departments. While such regulation is often perceived as an impediment to sales and installation of product, it can also protect the industry from unwarranted harm through negative publicity and lawsuits. The recent *Salmonella* infestation from peanut products is an example of an entire industry and distribution system being harmed by a single, unscrupulous company; the lawsuits are yet to come.

In POU/POE product treatment of water for health issues, the consequences of failure can cause harm and possibly deadly disease. Thus, the change from aesthetic to health concerns in the POU/POE industry will be difficult and will require a higher level of professionalism in the sales staff, the installation and repair departments and in the selection of products offered to the public.

POU/POE can be effective in treating small, private well, health-related problems, such as arsenic and other inorganic contaminants as well as for treatment of trace herbicides, pesticides and other organic substances by activated carbon, among other products. The use of chlorine, ozone and UV for private wells also has legitimate application, but not in all circumstances. One recent study looked at household treatment of water for poor populations, but would not go so far as to recommend it as a universal solution.

The industry will need to:

- Enforce adherence to established public health measures in private well applications
- Monitor product performance after the installation to adhere to specifications
- Assure adherence to product application guidelines
- Limit product claims to those tested and verified
- Cooperate with local public health officials
- Accept accountability and responsibility for product recommendations
- Sell for results, not profit

Unless and until these conditions are met, the POU/POE industry will remain outside the public health arena. ◆