

TOPIC: Backflow prevention and cross connection control not only protects the drinking water in day to day applications, but it can also be a protection against terrorist acts. Tell the public what you would suggest for them to be aware of - and do to protect the safe drinking water program(s) in your community.

ESSAY AS SUBMITTED:

Backflow Prevention and its Role in Preventing Water Terrorism

Backflow prevention and cross-connection control are effective ways to protect one's drinking (potable) water in everyday circumstances, but they are also means to protect one's water from terrorist attacks. The public needs to be aware of this possible threat to an imperative component of their daily needs and to become educated about the signs of an attack. It is necessary for water facilities to protect their water supplies during the introduction, treatment, and distribution processes to ensure that the community's drinking water is not contaminated.

Water and water systems are prime targets for terrorism because of their importance to human health. It is possible for water to be contaminated through the induction of poison or disease causing agents (Gleick). Homes and buildings on public water systems are susceptible to this type of terrorism because there is usually unprotected access to the distribution system. Anyone with an understanding of hydraulics and access to large amounts of toxic chemicals could contaminate a community's water supply in a relatively short time while avoiding detection. Also, terrorists would be most effective in causing adverse health effects by introducing a contaminant in water supplies closest to the consumer. Examples include water storage facilities and vulnerable points in the distribution system.

In 2002, four Moroccan terrorists associated with the Salafist Group for Call and Combat were arrested in Rome for conspiring to contaminate the water supplies in and around

the U. S. Embassy. They were in possession of a common cyanide-based industrial chemical (Potassium Ferricyanide), false documents, and detailed maps including the city's water system (Hoyle). It was believed that they were planning to launch an attack on the water system that affected thousands of people by executing a backflow attack. A backflow attack occurs when a pump is used to overcome the pressure gradient present in the distribution center's pumps. Once the pressure is overcome and the contaminant is introduced, the Bernoulli Effect pulls the contaminant into the system. Studies conducted by the US Air Force and Colorado State University have shown that this is a possible effective way of contaminating a system (Hoyle). After the September 11, 2001 terrorist attacks, surface water supplies, water treatment plants, and distribution systems were quickly acknowledged as potential targets of a terrorist attack. Although most water facilities are protected by certain safety measures, "virtually no water facilities are designed to prevent a deliberate and coordinated attack" (Hoyle). Therefore, the use of backflow prevention devices in these facilities would help to ensure safer drinking water.

Certain biological warfare (BW) agents have the potential to cause waterborne contamination. These fall in the categories of biological pathogens and biotoxins and require large dosages to result in a contamination. Although the filtration, ultraviolet radiation, ozonation, and chlorination process in water treatment plants are effective in destroying most biological pathogens and reducing the concentration of harmful chemicals, certain forms of BW agents can be resistant and pose a danger to the public (Burrows). Cryptosporidiosis is a gastrointestinal infection resulting from the ingestion of the oocysts of the protozoan, *Cryptosporidium parvum*, and is commonly contracted from drinking water infected with cattle wastes (Burrows). These oocysts are highly resistant to chlorine-based disinfection and are stable in water for many days. It is unknown whether this agent has been weaponized, but it has been suggested as a possible

agent for sabotaging potable water supplies. One example of the possible damages that a water-borne distribution of this contaminant is the non-terrorist related outbreak of *Cryptosporidium* in the water system in Milwaukee in 1993. This killed over one hundred people and affected the health of over 400,000 more.

Other previously weaponized replicating agents that are water threats include anthrax, brucellosis, plague, and Q fever. Biotoxins that are stable in water and are resistant to chlorine treatment include aflatoxin, ricin, saxitoxin, and microcystins (Burrows). Most of these agents cause severe gastrointestinal distress, may require hospitalization, and could die without proper medical care. In 1970, two members of the right wing “Order of the Rising Sun” were arrested with forty kilograms of typhoid cultures that were allegedly to be used to poison the water supplies in cities such as Chicago and St. Louis (Gleick). These cultures could have caused major health effects if they were introduced after chlorination and during the distribution process.

The public needs to be aware of the signs of contamination in their water. The addition of a contaminant to a water system can go unnoticed due to the fact that many microorganisms are so miniscule that up to 6 million bacteria need to be present in each milliliter of water before it appears less than clear (Hoyle). If a threat is detected as it enters a water treatment plant, the plant is usually shut down while the contaminant is neutralized and the affected community is put on a “boil water” alert. Heating water to high temperatures is extremely effective in killing bacterial agents. However, this is only the best case scenario, for a contaminant may go undetected. The first evidence of a contamination may be increased incidences of sickness and death. People need to watch for these occurrences, especially if they have noticed a change in the taste or smell of their drinking water.

Backflow prevention devices are critical to avoiding water contamination. Backflow is defined as “the undesirable reversal of flow of non-potable water or other substances through a cross-connection and into the piping of a public water system or consumer’s potable water system” (West Coast Backflow). Backsiphonage is one type of backflow that results from reduced pressure in the distribution system and allows for contaminants to be introduced because of reversed flow direction. Backflow is dangerous because it can cause toxins from areas such as pools, sewage, and other sites where bacteria and chemicals reside, to flow into one’s drinking water. These are only examples of accidental contamination, which are extremely common. Therefore, backflow can be used as an uncomplicated means to cause harm to others.

Terrorists are extremely likely to introduce a toxin through distribution sites by means of backflow attack. The most basic and effective way to prevent backflow is an air gap, which eliminates a cross-connection or provides a barrier to backflow. It is a vertical, physical separation between the end of a water supply outlet and the flood level rim of a receiving vessel (West Coast Backflow). This air gap should never be less than one inch. Other backflow preventers include reduced a pressure principle assembly, a pressure vacuum breaker assembly, a double check valve assembly, and residential dual check valves. These devices are most effective when installed at the service connection to a facility. Use of these preventers could protect members of a community from dangerous toxins deliberately or accidentally introduced. Other developing technologies could be used in source water and water distribution systems to quickly detect pathogens. These technologies include “DNA microchip arrays, immunologic techniques, microrobots, a variety of optical technologies, flow cytometry, molecular probes, and other techniques”(Foran).

Water is a fundamental resource to society, and when its quality is threatened, devastating consequences can occur. It is up to water facilities to protect citizens through backflow prevention, cross-connection control, and contamination detection tools. The public should be informed on the reality of this threat and the signs that indicate water terrorism. Elected officials could also push for more funding to protect and periodically test communities' water supplies. With education and prevention methods, people's safety and health can be protected from water hazards.

References

I certify that this essay is my own work, and that any ideas or quotations from the work of other people, published or otherwise, are fully referenced.

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