

Advancing the Science of Water: AwwaRF and Providing Data for Sound Regulations

AwwaRF contributions to the science of drinking water have provided far-reaching benefits. Its research results enable AwwaRF subscribers and other utility professionals to make up-to-date decisions for protecting public health, and its cutting-edge data have helped to shape the provisions of a number of U.S. water quality regulations, ensuring that regulatory requirements are actually achievable and lowering the cost of compliance for utilities and consumers alike.

AwwaRF's role in the regulatory development process is acknowledged by members of the regulatory community as well as practitioners in utilities and consulting firms. "Without question, AwwaRF research has been helpful in the development of federal water quality regulations," said Fred Hauchman, director of the U.S. Environmental Protection Agency's (USEPA's) Microbiological and Chemical Exposure Assessment Research Division. "Any avenue that provides a sounder, more scientific basis for regulations is good, and AwwaRF tries very hard to do that."

Stig Regli, a USEPA policy analyst who develops standards and guidelines for regulations, underscores his colleague's observations. "AwwaRF studies have provided data to support USEPA's economic assessments of the regulations and have contributed to the development of specific regulatory criteria and guidelines," he said.

AwwaRF's research on occurrence, analytical methods, health effects, and treatment methods has supplied crucial data for standards regulating chemical, microbiological, and inorganic contaminants in drinking water. "You can hardly talk about a regulation that doesn't have a significant component related to AwwaRF research," said Mark LeChevallier, director of innovation and environmental stewardship at American Water.

Detailed information on AwwaRF's contributions to specific water quality regulations and on the projects that produced data used to craft these rules is presented in other sections of this document—particularly those covering emerging contaminants and innovative technologies. Some of the most significant ways in which AwwaRF research has influenced regulatory activity are highlighted here:

- Facilitating scientific dialogue and cooperation among water suppliers and the regulatory community.
- Assuring high-quality research by including representatives of a variety of stakeholders on its Research Advisory Council and Project Advisory Committees.

- Funding the research of numerous investigators who have participated in regulatory negotiation discussions.
- Identifying the research needed to answer questions arising during the regulatory development process.
- Assisting in the development of Colilert[®], a USEPA-approved method for 24-hour analysis of total coliforms and *E. coli* under the Total Coliform Rule
- Aiding development of the Stage 1 Disinfectants/Disinfection By-products (D/DBP) Rule by supplying baseline data on the treatability of DBPs in U.S. water supplies.
- Generating the DBP precursor removal data on which the enhanced coagulation criteria of the Stage 1 D/DBP Rule were based.
- Helping to shape the provisions of the Stage 2 D/DBP Rule by compiling a collection of case studies describing utilities' experience in complying with the Stage 1 Rule.
- Ensuring a more balanced Stage 2 D/DBP Rule by providing new epidemiologic data on the relationship between DBPs and cancer and reproductive risks.
- Demonstrating that regulations aimed at protecting consumers from pathogens and DBPs should be considered in tandem.
- Producing guidance manuals on two alternative disinfectants—ozone and ultraviolet (UV) light.
- Supporting the filtration avoidance criteria specified in the Surface Water Treatment Rule by supplying data on disinfection concentration and contact time.
- Contributing particle counting data used in determining provisions in the Interim and Long Term 1 Enhanced Surface Water Treatment Rules aimed at tightening the filtration process.
- Providing data to support the inclusion of UV disinfection as a technique for controlling *Cryptosporidium* in the Long Term 2 Enhanced Surface Water Treatment Rule.
- Producing data used to establish the criteria through which water systems that don't filter can achieve *Cryptosporidium* inactivation.
- Furnishing treatment technology and cost data cited in the Arsenic Rule.
- Generating the biofilm data being discussed in relation to revising the Total Coliform Rule.
- Supporting regulatory activity related to distribution system water quality through a strategic research initiative aimed at identifying high-priority projects and executing them quickly.

AwwaRF's Procedures Promote Cooperation

AwwaRF's policy of including representatives from an array of stakeholder groups on its Research Advisory Council and Project Advisory Committees not only has enhanced the quality of its research projects but also has fostered a spirit of cooperation between the water supply community and the regulators. Several USEPA staff members confirmed the constructive nature of this collegial atmosphere.

"Through AwwaRF's Project Advisory Committees, a variety of stakeholders participate in shaping and interpreting the research," said Regli. "This kind of collaboration helps to facilitate dialogue and identify emerging issues. It also helps to resolve issues and facilitates compromise. AwwaRF has helped to develop the relationship between water suppliers and USEPA, helping the industry and the regulatory agency work together to solve problems," he added.

"Because USEPA has been represented on AwwaRF's Research Advisory Council and on advisory committees for individual projects, we've had the opportunity to advocate for research that's important to the agency," Hauchman noted.

"The most critical AwwaRF arsenic project completed before the Arsenic Rule was finalized was 'Arsenic Treatability Options and Evaluation of Residuals Management Issues,'" said Jeff Kempic, Treatment Technology and Cost Team Leader in USEPA's Standards and Risk Management Division. "I was a member of that project advisory committee, so I had a draft report before the final report was published. We cited both reports in the section of the rule labeled Technologies and Costs for the Removal of Arsenic from Drinking Water."

Kempic also noted the value of AwwaRF research with respect to regulatory compliance. "Many of AwwaRF's arsenic projects were funded after the Arsenic Rule was promulgated, but these studies have a regulatory benefit in that they help water utilities and state primacy agencies evaluate treatment options for complying with the rule," he said. "Some of the newer alternatives are proving more effective than many of the technologies that were available at the time the rule was developed."

Quantifying the Value of AwwaRF Research in Past Regulatory Activity

A 2001 study assessing the value of AwwaRF research in regulatory development and compliance concluded that the primary benefits were enhanced protection of public health and reductions in the cost of compliance. The study, conducted by Bob Raucher of Stratus Consulting, focused on quantifying these two types of benefits in relation to the Arsenic Rule, the Radon Rule, and the cluster of rules involving the Stage 2 D/DBP and Enhanced Surface Water Treatment rules.

In addition to providing background information on the development of these regulations, the project report summarized AwwaRF's major contributions to the provisions of each rule and estimated the value of these contributions by analyzing their costs and benefits. "The analysis . . . indicates that AwwaRF's investments in research have paid large dividends in terms of promoting regulatory developments that protect health and save utility customers money," Raucher wrote. Although he conceded that the study's cost-benefit ratios were only estimates, he claimed that "benefits outweigh costs by at least 120 to 1, even under very conservative assumptions."

The report also described AwwaRF's support of the development of the analytical method Colilert[®]—an inexpensive, easy-to-use, USEPA-approved technique for monitoring total

coliforms and *E. coli* under the Total Coliform Rule. Another section of the report discussed the regulatory relevance of AwwaRF's research on two emerging contaminants, perchlorate and methyl *tertiary* butyl ether (MTBE). Perchlorate, a salt of perchloric acid, is believed to get into water supplies through contamination by the solid rocket industry. MTBE, an octane booster for unleaded gasoline, has found its way into groundwater wells from nearby leaking underground fuel tanks. Surface water supplies are also vulnerable to MTBE contamination, primarily through motorized recreational watercraft.

Appendix A of the Raucher report summarized the AwwaRF arsenic projects funded through 2000, including those managed by the Arsenic Research Partnership, an alliance of AwwaRF, USEPA, and the Association of California Water Agencies. Appendix B described AwwaRF's most significant radon studies.

The Raucher report's discussion of AwwaRF's contributions to the Stage 2 D/DBP and Enhanced Surface Water Treatment rules concentrated on the foundation's UV research. Information about the influence of other aspects of AwwaRF research on this cluster of rules is detailed in the sections of this document covering Disinfection By-products and *Giardia* and *Cryptosporidium*.

AwwaRF's Involvement in Current Regulatory Activity

In mid-2007, USEPA began work to revise the Total Coliform Rule, originally promulgated in 1989. As with the Stage 1 and 2 D/DBP rules, this will be a negotiated rule-making process involving stakeholders from various aspects of the drinking water community as well as regulatory agency personnel. A number of AwwaRF investigators will participate or play a supporting role in the negotiations.

"I've worked with the regulatory negotiation process since 1993," said Alan Roberson, director of security and regulatory affairs for AWWA. "AwwaRF has always been represented at the table—not as an organization but through its investigators. AwwaRF's research results will play a critical role in how the revised Total Coliform Rule plays out over the next five or ten years."

Roberson dubbed distribution system water quality the next frontier of regulatory activity. "AwwaRF has probably produced a hundred reports dealing with distribution system water quality," he said. "The challenge for the group that's working on revising the Total Coliform Rule is determining which of these studies are most important and how to extract the relevant information. They will probably assess what's working with the current regulation and what's not. Then they'll look at the body of research to see what information points to better regulatory alternatives," he predicted.

"AwwaRF's strategic initiative for research on this topic is aimed at supporting this regulatory effort by identifying high-priority projects and getting them started as quickly as possible," Roberson continued. "AwwaRF also has a new research initiative on emerging contaminants. The foundation has done a good job of keeping up with the most

significant emerging contaminants over the past five to ten years and then doing the appropriate research," he added.

AwwaRF's Goals in Relation to Future Regulatory Activity

Regulatory development and compliance needs are sure to influence future research priorities at AwwaRF, just as they have in the past. The standard-setting process set forth in the 1996 Safe Drinking Water Amendments calls for the use of "good science" in the development of regulations, and AwwaRF will undoubtedly continue to be considered a primary source of data fulfilling this criterion.

If anything, the need for good science in the regulatory development process will intensify as water quality regulations become increasingly complex. In a March 2006 *Journal AWWA* article, Roberson noted that "National drinking water regulations began moving from simple mathematical compliance with maximum contaminant levels to more complicated treatment techniques with more potential violations, starting with the Surface Water Treatment Rule and the Total Coliform Rule in 1989 and the Lead and Copper Rule in 1991." He said this trend toward complexity has continued with the D/DBP and Enhanced Surface Water Treatment rules.

Future regulations for emerging contaminants will need to be based on credible occurrence and health effects data and will require cost-benefit analyses and perhaps new analytical and treatment techniques. And as utilities struggle to comply with all of the regulations simultaneously, their need for reliable data on treatment methods, costs, operational considerations, and other compliance-related issues will only expand.