

# American Water Works Association Research Foundation's Impacts on the UV Disinfection Regulatory Process

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Starting in 1992, the American Waterworks Association Research Foundation (AwwaRF) has had an active research program to study UV light, and in particular, UV disinfection of drinking waters. Results of AwwaRF's research have contributed greatly to the body of knowledge that permitted EPA to declare UV disinfection an "available technology". As a result, UV disinfection is gaining widespread acceptance in the USA, resulting in increased public health protection against many pathogens.

When the Surface Water Treatment Rule was promulgated in 1989, UV light was not recognized as an effective disinfectant for protozoans such as Giardia and Cryptosporidium. Nearly a decade later, in 1998, the Stage 1 Microbial and Disinfection By-Product Rules did not consider UV disinfection, as its effectiveness against Cryptosporidium was still unknown.

By the late 1990s the U.S. Environmental Protection Agency (USEPA) had begun work on the Stage 2 Microbial - Disinfection By-Product Rules. Under the Federal Advisory Committee Act (FACA), the regulatory process allowed for negotiations between a broad group of stakeholders and federal regulators. A Microbial and Disinfection By-Products FACA group met with federal regulators to discuss the Stage 2 rules. This group relied heavily on the AwwaRF's work and other scientific advances. Several AwwaRF researchers, including recognized leaders in UV research and design, such as Dr. James Bolton; Dr. Jennifer Clancy; Christine Cotton, P.E.; Robert Cushing, P.E.; Robert Hulse, P.E.; Dr. Karl Linden; Dr. Erin Mackey, P.E.; Dr. James Malley; Doug Owen, P.E.; and Harold Wright, P.E.; served as technical advisors to this process.

As a result, the FACA Committee recommended that EPA incorporate provisions into the Long Term 2 Surface Water Treatment Rule (LT2ESWTR) to facilitate approval and implementation of UV technologies.

In addition, AwwaRF cosponsored with the National Water Research Institute a project to revise the UV disinfection guidelines for reuse, wastewater, and drinking water treatment.

Many AwwaRF researchers continue to work with EPA to develop a UV disinfection guidance manual. AwwaRF's

efforts truly have been a collaborative effort with partners in North America and throughout the European community, and have assisted this "new" technology to be implemented in the USA at an unprecedented pace. The table below summarizes AwwaRF's funded research on UV disinfection.

AwwaRF will continue to collaborate with the water industry to bring research advancements to the state of UV disinfection. These research efforts will help EPA make better decisions when developing regulatory requirements and providing guidance for UV disinfection.

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<b>Project No.</b>	<b>Project Title</b>	<b>Funded</b>
180	UV Inactivation of Viruses in Natural Waters	1994
282	Innovative Electrotechnologies for Cryptosporidium Inactivation	1995
289	Advanced Oxidation and Biodegradation Processes for the Destruction of TOC and DBP Precursors	1995
442	Inactivation of Waterborne Emerging Pathogens by Selected Disinfectants	1997
474	Full-Scale Implementation of Ultraviolet Disinfection in Groundwater Treatment Systems	1997
621	Alternative Disinfection Technologies for Small Drinking Water Systems	1990
809	Evaluation of the By-products Produced by the Treatment of Groundwaters With Ultraviolet Radiation (UV)	1992
2593	Inactivation of Pathogens by Innovative UV Technologies	1999
2599	Innovative UV Technologies to Oxidize Organic and Organoleptic Chemicals	1999
2601	Removal of MTBE With Advanced Oxidation Processes	1999
2623	Practical Aspects of UV Disinfection	1999
2641	Application of KI Actinometry to UV Reactor Dosimetry	1999
2668	Disinfection Efficiency and Dose Measurement of Polychromatic UV Light	1999
2669	Cryptosporidium Oocyst Repair Following UV Disinfection	2000
2674	Protocol for Designing and Conducting UV Disinfection Studies	2000
2682	Hydrodynamic Characterization of UV Reactors	2000
2721	Susceptibility of Multiple Strains of <i>C. parvum</i> to UV Light	2000
2723	Impact of UV Disinfection on Biological Stability	2000
2747	UV Disinfection and Disinfection By-Product Characteristics of Unfiltered Waters	2001
2749	Evaluation of Ozone and Ultraviolet Light	2001
2750	Application of the LT2ESWTR Toolbox to Retrofit Existing Water Plants	2001
2768	UV Disinfection for Large Water Treatment Plants	2001
2788	Removal of Contrast Media	2001
2790	Effectiveness of UV Inactivation of Cryptosporidium Oocysts Under Realistic Conditions Using Cell Culture Techniques	2001
2817	Development of a Particle Actinometer	2001
2861	Integrating UV Disinfection Into Existing Water Treatment Plants	2002
2897	Impact of UV and UV Advanced Oxidation Processes on Toxicity of Endocrine Disrupting Compounds in Water	2002
2949	Dosimeters for UV Dose Verification and Monitoring	2003
2977	Design and Performance Guidelines for UV Sensor Systems	2003
2983	Optimization of UV Reactor Validation	2003