

*lamblia* and virus treatment requirements, as established by the SWTR in 40 CFR 141.72 and 141.74. However, for systems using UV light, modified compliance standards are proposed, due to the different way in which UV disinfection systems will be monitored.

Each day a system using ozone or chlorine dioxide serves water to the public, the system must calculate the CT value(s) from the system's treatment parameters, using the procedures specified in 40 CFR 141.74(b)(3). The system must determine whether this value(s) is sufficient to achieve the required inactivation of *Cryptosporidium* based on the CT criteria specified in section IV.C.14. The disinfection treatment must ensure at least 99 percent (or 99.9 percent if required) inactivation of *Cryptosporidium* every day the system serves water to the public, except any one day each month. Systems are required to report daily CT values on a monthly basis, as described in section IV.J.

Each day a system using UV light serves water to the public, the system must monitor for the parameters, including flow rate and UV intensity, that demonstrate whether the system's UV reactors are operating within the range of conditions that have been validated to achieve the required UV dose, as specified in section IV.C.15. Systems must monitor each UV reactor while in use and must record periods when any reactor operates outside of validated conditions. The disinfection treatment must ensure at least 99 percent (or 99.9 percent if required) inactivation of *Cryptosporidium* in at least 95 percent of the water delivered to the public every month. Systems are required to report periods when UV reactors operate outside of validated conditions on a monthly basis, as described in section IV.J.

Unfiltered systems currently must comply with requirements for DBPs as a condition of avoiding filtration under 40 CFR 141.71(b)(6). As described earlier, EPA is developing a Stage 2 DBPR, which will further limit allowable levels of certain DBPs, specifically trihalomethanes and haloacetic acids. EPA intends to incorporate new standards for DBPs established under the Stage 2 DBPR into the criteria for filtration avoidance.

## 2. How Was This Proposal Developed?

*a. Basis for Cryptosporidium treatment requirements.* The intent of the proposed treatment requirements for unfiltered systems is to achieve public health protection against

*Cryptosporidium* equivalent to filtration systems. As described in section III.C, an assessment of survey data indicates that under current treatment requirements, finished water *Cryptosporidium* levels are higher in unfiltered systems than in filtered systems.

Information Collection Rule data show an average plant-mean *Cryptosporidium* level of 0.59 oocysts/L in the source water of filtered plants and 0.014 oocysts/L in unfiltered systems. Median plant-mean concentrations were 0.052 and 0.0079 oocysts/L in filtered and unfiltered system sources, respectively. Thus, these results suggest that typical *Cryptosporidium* occurrence in filtered system sources is approximately 10 times higher than in unfiltered system sources.

In translating these data to assess finished water risk, EPA and the Advisory Committee estimated that conventional plants in compliance with the IESWTR achieve an average *Cryptosporidium* removal of 3 log (see discussion in section III.D). Hence, if the median source water *Cryptosporidium* level at conventional plants is approximately 10 times higher than at unfiltered systems, and it is estimated that conventional plants achieve an average reduction of 3 log (99.9%), then the median finished water *Cryptosporidium* concentration at conventional plants is lower by a factor of 100 than at unfiltered systems. Therefore, to ensure equivalent public health protection, unfiltered systems should reduce *Cryptosporidium* levels by 2 log.

Due to the development of criteria for *Cryptosporidium* inactivation with ozone, chlorine dioxide, and UV light, EPA has determined that it is feasible for unfiltered systems to comply with a *Cryptosporidium* treatment technique requirement. Consequently, EPA is proposing that all unfiltered systems provide at least 2 log inactivation of *Cryptosporidium*.

The proposed treatment requirements for unfiltered systems with higher source water *Cryptosporidium* levels are consistent with proposed treatment requirements for filtered systems. As discussed previously, EPA is proposing that filtered plants with mean source water *Cryptosporidium* levels between 0.075 and 1.0 oocysts/L, as measured by Methods 1622 and 1623, provide at least a 4 log reduction (with greater treatment required for higher source water pathogen levels). These requirements will achieve average treated water *Cryptosporidium* concentrations below 1 oocyst/10,000 L in filtered systems. An unfiltered system with a mean

source water *Cryptosporidium* concentration above 0.01 oocyst/L would need to provide more than 2 log inactivation in order to achieve an equivalent finished water oocyst level. Therefore, EPA is proposing that unfiltered systems provide at least 3 log inactivation where mean concentrations exceed 0.01 oocysts/L.

For unfiltered systems using UV disinfection to meet these proposed *Cryptosporidium* treatment requirements, EPA is proposing that compliance be based on a 95th percentile standard (*i.e.*, at least 95 percent of the water must be treated to the required UV dose). This standard is intended to be comparable with the "every day except any one day per month" compliance standard established by the SWTR for chemical disinfection (see 40 CFR 141.72(a)(1)). Because UV disinfection systems will typically consist of multiple parallel reactors that will be monitored continuously, the Agency has determined that it is more appropriate to base a compliance determination on the percentage of water disinfected to the required level, rather than a single daily measurement. The UV Disinfection Guidance Manual (USEPA 2003d) will provide advice on meeting this proposed standard. A draft of this guidance is available in the docket for today's proposal (<http://www.epa.gov/edocket/>).

*b. Basis for requiring the use of two disinfectants.* EPA is proposing that unfiltered systems use at least two different disinfectants to meet the 2 (or 3), 3, and 4 log inactivation requirements for *Cryptosporidium*, *Giardia lamblia*, and viruses, respectively. The purpose of this requirement is to provide for multiple barriers of protection against pathogens. One benefit of this approach is that if one barrier were to fail then there would still be one remaining barrier to provide protection against some of the pathogens that might be present. For example, if a plant used UV to inactivate *Cryptosporidium* and *Giardia lamblia*, along with chlorine to inactivate viruses, and the UV system were to malfunction, the chlorine would still meet the treatment requirement for viruses and would provide some degree of protection against *Giardia lamblia*.

Another benefit of multiple barriers is that they will typically provide more effective protection against a broad spectrum of pathogens than a single disinfectant. Because the efficacy of disinfectants against different pathogens varies widely, using multiple disinfectants will generally provide more efficient inactivation of a wide