

reliable for estimating concentrations at individual plants. However, the Information Collection Rule included a much larger number of plants (350 v. 40 each for the ICRSS medium and large system surveys) and, consequently, may be more reliable for estimating occurrence nationally. The surveys included a similar number of samples per plant (18 v. 24 in the ICRSS). The two surveys cover different time periods (7/97–12/98 for the Information Collection Rule and 3/99–2/00 for the ICRSS).

In order to better understand the factors that may account for the differences in the three data sets, EPA conducted several additional analyses. First, EPA compared results for the subset of 40 plants that were in both the Information Collection Rule and ICRSS large system surveys. The medians for the two data sets were 0.13 and 0.045 oocysts/L, respectively, while the 90th percentiles were 1.5 and 0.24 oocysts/L. Clearly, the discrepancy between the two surveys persists for the subsample of data from plants that participated in both surveys. This suggests that the different sample groups in the full data sets are not the primary factor that accounts for the different results.

Next, EPA looked at the six month period (July through December) that was sampled in two consecutive years (1997 and 1998) during the Information Collection Rule survey to investigate year-to-year variations at the same plants. Estimated medians for 1997 and 1998 were 0.062 and 0.040 oocysts/L, respectively, while the 90th percentiles were 1.1 and 1.3 oocysts/L. While these comparisons show some interyear variability, it is less than the variability observed between the Information Collection Rule and ICRSS data sets. EPA has no data comparing the same plants using the same methods for the time periods in question (1997–98 and 1999–2000) so it is not known if the variation between these time periods was larger than the apparent variation between 1997 and 1998 in the Information Collection Rule data set.

The choice of data set has a significant effect on exposure, cost, and benefit estimates for the LT2ESWTR. Due to the lack of any clear criterion for favoring one data set over the other, EPA has conducted the analyses for this proposed rule separately for each, and presents a range of estimates based on the three data sets. EPA requests comment on this approach. EPA will continue to evaluate the relative strengths and limitations of the three data sets, as well as any new data that may become available for the final rule.

D. Treatment

1. Overview

This section presents information on treatment processes for reducing the risk from *Cryptosporidium* in drinking water. Treatment information is critical to two aspects of the LT2ESWTR: (1) estimates of the efficiency of water filtration plants in removing *Cryptosporidium* are used in assessing risk in treated drinking water and (2) the performance and availability of treatment technologies like ozone, UV light, and membranes that effectively inactivate or remove *Cryptosporidium* impact the feasibility of requiring additional treatment for this pathogen.

The majority of plants treating surface water use conventional filtration treatment, which is defined in 40 CFR 141.2 as a series of processes including coagulation, flocculation, sedimentation, and filtration. Direct filtration, which is typically used on sources with low particulate levels, includes coagulation and filtration but not sedimentation. Other common filtration processes are slow sand, diatomaceous earth (DE), membranes, and bag and cartridge filters.

For the IESWTR (and later the LT1ESWTR), EPA evaluated results from pilot and full scale studies of *Cryptosporidium* removal by various types of filtration plants. Based on these studies, EPA concluded that conventional and direct filtration plants meeting IESWTR filter effluent turbidity standards will achieve a minimum 2 log (99%) removal of *Cryptosporidium*. The Agency reached the same conclusion for slow sand and DE filtration plants meeting SWTR turbidity standards. Treatment credit for technologies like membranes and bag and cartridge filters was to be made on a product-specific basis.

Subsequent to promulgating the IESWTR and LT1ESWTR, EPA has reviewed additional studies of the performance of treatment plants in removing *Cryptosporidium*, as well as other micron size particles (e.g., aerobic spores) that may serve as indicators of *Cryptosporidium* removal. As discussed later in this section, the Agency has concluded that these studies support an estimate of 3 log (99.9%) for the average *Cryptosporidium* removal efficiency of conventional treatment plants in compliance with the IESWTR or LT1ESWTR. Section IV.A describes how this estimate of average removal efficiency is used in determining the need for additional *Cryptosporidium* treatment under the LT2ESWTR. Further, this estimate is consistent with

the Stage 2 M–DBP Agreement in Principle, which states as follows:

The additional treatment requirements in the (LT2ESWTR) bin requirement table are based, in part, on the assumption that conventional treatment plants in compliance with the IESWTR achieve an average of 3 logs removal of *Cryptosporidium*.

In addition, the Agency finds that available data support an estimate of 3 log average *Cryptosporidium* removal for well operated slow sand and DE plants. Direct filtration plants are estimated to achieve a 2.5 log average *Cryptosporidium* reduction, in consideration of the absence of a sedimentation process in these plants.

The most significant developments in the treatment of *Cryptosporidium* since IESWTR promulgation are in the area of inactivation. During IESWTR development, EPA determined that available data were not sufficient to identify criteria for awarding *Cryptosporidium* treatment credit for any disinfectant. As presented in section IV.C.14, EPA has now acquired the necessary data to specify the disinfectant concentrations and contact times necessary to achieve different levels of *Cryptosporidium* inactivation with chlorine dioxide and ozone. Additionally, recent studies have demonstrated that UV light will produce high levels of *Cryptosporidium* and *Giardia lamblia* inactivation at low doses. Section IV.C.15 provides criteria for systems to achieve credit for disinfection of *Cryptosporidium*, *Giardia lamblia*, and viruses by UV.

This section begins with a summary of treatment information considered for the IESWTR and LT1ESWTR, followed by a discussion of additional data that EPA has evaluated since promulgating those regulations. Further information on treatment of *Cryptosporidium* is available in Technologies and Costs for Control of Microbial Contaminants and Disinfection Byproducts (USEPA 2003c), Occurrence and Exposure Assessment for the Long Term 2 Enhanced Surface Water Treatment Rule (USEPA 2003b) and section IV.C of this preamble.

2. Treatment information considered for the IESWTR and LT1ESWTR

Treatment studies that were evaluated during development of the IESWTR are described in the IESWTR NODA (62 FR 59486, November 3, 1997) (USEPA 1997b), the Regulatory Impact Analysis for the IESWTR (USEPA 1998d), and Technologies and Costs for the Microbial Recommendations of the M/DBP Advisory Committee (USEPA 1997b). Treatment information considered in development of the