



Figure III-5.-- Inactivation of *Cryptosporidium* by UV Light

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Figure III-5 presents data from selected studies of UV inactivation of *Cryptosporidium*. While the data in Figure III-5 show substantial scatter, they are consistent in demonstrating a high level of inactivation at relatively low UV doses. These studies generally demonstrated at least 3 log *Cryptosporidium* inactivation at UV doses of 10 mJ/cm<sup>2</sup> and higher. In comparison, typical UV dose for drinking water disinfection are 30 to 40 mJ/cm<sup>2</sup>. A recent investigation by Clancy *et al.* (2002) showed that UV light at 10 mJ/cm<sup>2</sup> provided at least 4 log inactivation of five strains of *Cryptosporidium* that are infectious to humans. Studies of UV inactivation of *Giardia* have reported similar results (Craik *et al.* 2000, Mofidi *et al.* 2002, Linden *et al.* 2002, Campbell and Wallis 2002, Hayes *et al.* 2003).

In addition to efficacy for protozoa inactivation, data indicate that UV disinfection does not promote the formation of DBPs (Malley *et al.* 1995,

Zheng *et al.* 1999). Malley *et al.* (1995) evaluated DBP formation in a number of surface and ground waters with UV doses between 60 and 200 mJ/cm<sup>2</sup>. UV light did not directly form DBPs, such as trihalomethanes (THM) and haloacetic acids (HAA), and did not alter the concentration or species of DBPs formed by post-disinfection with chlorine or chloramines. A study by Zheng *et al.* (1999) reported that applying UV light following chlorine disinfection had little impact on THM and HAA formation. In addition, data suggest that photolysis of nitrate to nitrite, a potential concern with certain types of UV lamps, will not result in nitrite levels near the MCL under typical drinking water conditions (Peldszus *et al.* 2000, Sharpless and Linden 2001).

These studies demonstrate that UV light is an effective technology for inactivating *Giardia* and *Cryptosporidium*, and that it does not form DBPs at levels of concern in drinking water. Section IV.C.15

describes proposed criteria for awarding treatment credit for UV inactivation of *Cryptosporidium*, *Giardia lamblia*, and viruses. These criteria include UV dose tables, validation testing, and monitoring standards. In addition, EPA is preparing a UV Disinfection Guidance Manual with information on design, testing, and operation of UV systems. A draft of this guidance is available in the docket for today's proposal (<http://www.epa.gov/edocket/>).

iii. Significance of new information on inactivation. The research on ozone, chlorine dioxide, and UV light described in this proposal has made these disinfectants available for systems to use in meeting additional *Cryptosporidium* treatment requirements under LT2ESWTR. This overcomes a significant limitation to establishing inactivation requirements for *Cryptosporidium* that existed when the IESWTR was developed. The Stage 1 Advisory Committee recognized the need for inactivation criteria if EPA were to consider a risk based proposal